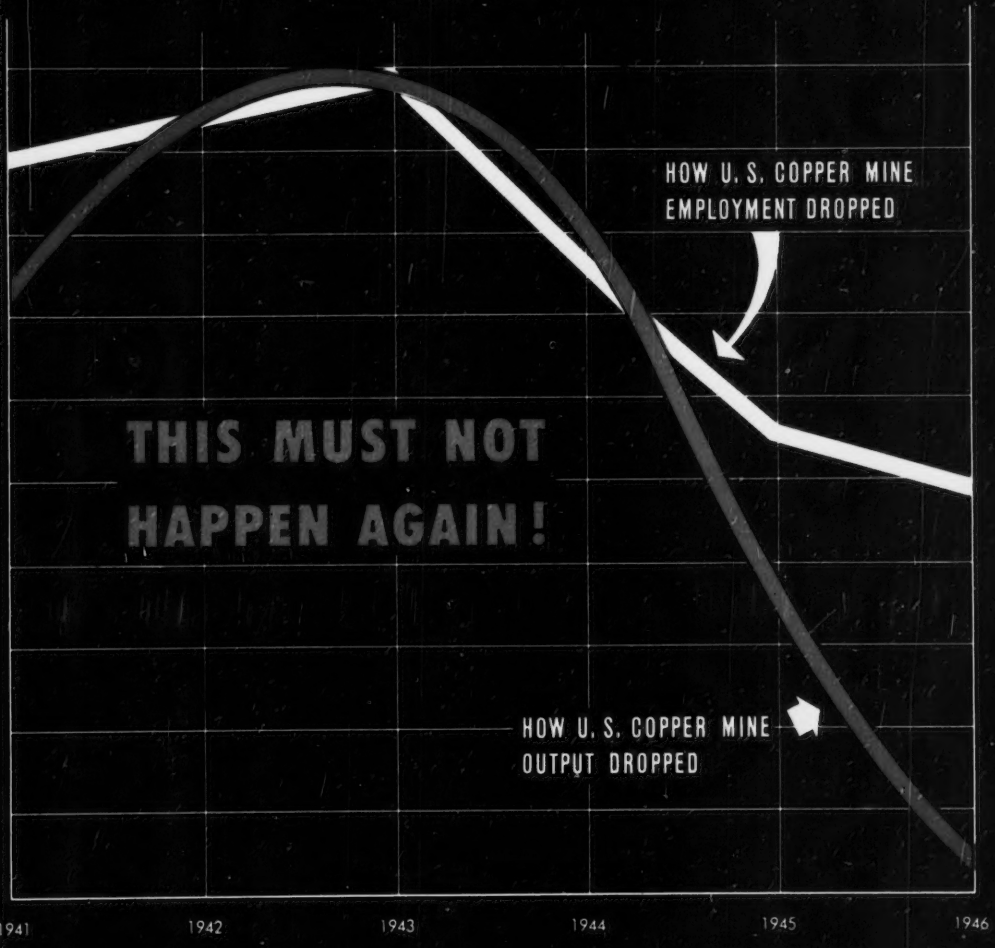
ENGINEERING AND MINING JOURNAL

A McGRAW-HILL PUBLICATION

OCTOBER 1950

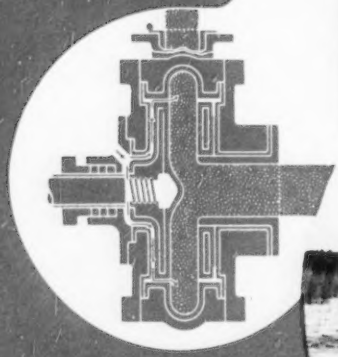
FOUNDED 1866

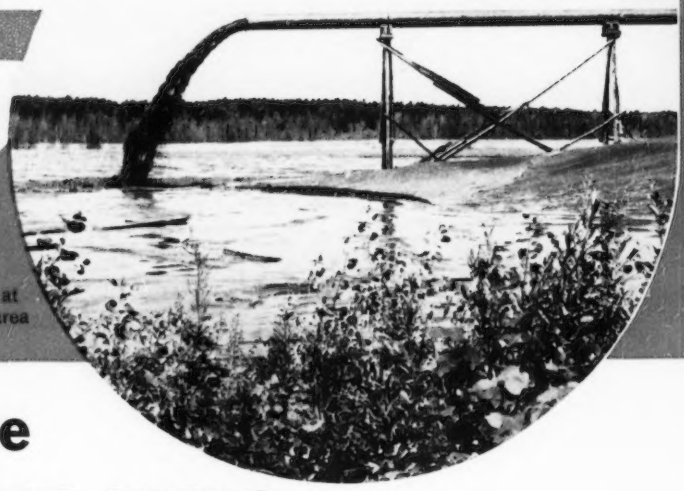
Give enough!
1950 RED FEATHER SERVICES



Read LET'S STOP THE **MANPOWER MUDDLE**

BEFORE IT'S TOO LATE... SEE PAGE 72



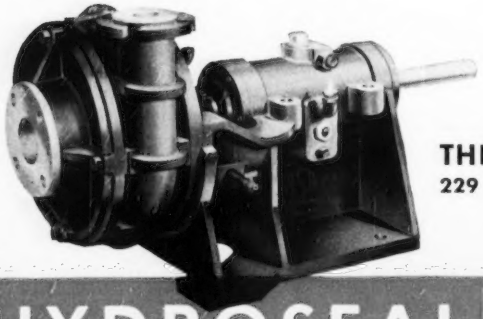


Discharge at tailings area

One of the TOUGHEST JOBS in the Mesabi Iron Range

Jobs for pumps don't come much tougher than this, so the assignment was given to a pair of G-Frame Hydroseals. These two big pumps take turns pumping tailings through 7700 feet of 18-inch pipe at the concentration plant of one of Minnesota's largest iron-ore producers. They handle 446,400 gallons of pulp per hour, the solids amounting to 450 long tons per hour. The static lift is 76 feet; the discharge pressure is 100 psi. In spite of the terrific load these pumps carry, maintenance costs are relatively low, owing to the Hydrosealing principle and the use of the amazingly wear-resistant ASH-21 alloy for impeller, shell and suction sleeve.

Hydroseals are the first choice of mill men all over the world—for their ruggedness, dependability and economy. We'd like to tell you how they answer your pumping problem. Write us today.



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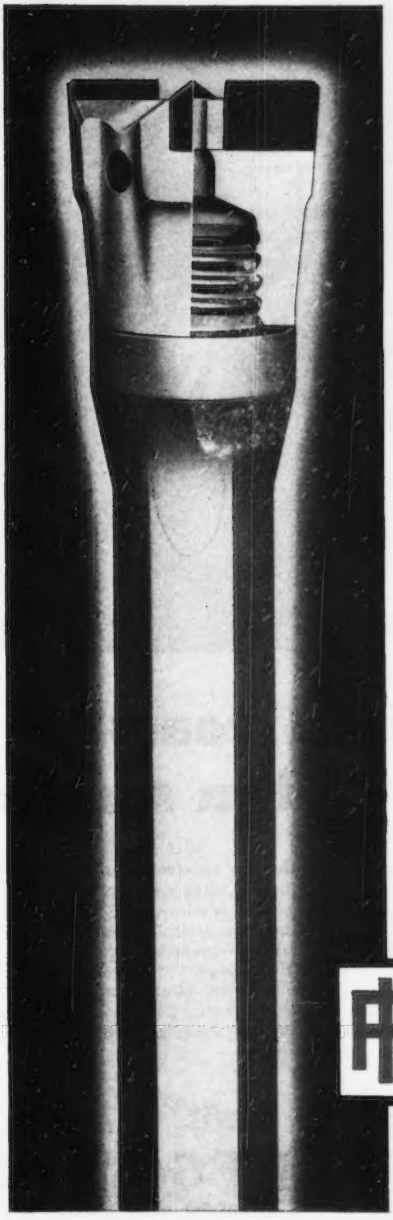
HYDROSEAL SAND, SLURRY & DREDGE PUMPS
MAXIMIX RUBBER PROTECTED

HYDROSEAL, PACKLESS AND MAXIMIX DESIGNS ARE COVERED BY PATENTS AND APPLICATIONS IN THE MAJOR MINING CENTERS OF THE WORLD

Here's why

CARSET JACKBITS



have changed the entire concept of today's rock drilling costs

Since the advent of the Carset Jackbit, drilling costs can no longer be reckoned *only* in terms of bit cost per foot of hole. For this is only *one of many* items where Carset Jackbits have made possible tremendous over-all savings.

Check the fourteen economies listed below. Note how any one of them by itself makes a significant reduction in the cost of drilling rock. But only when you consider the cumulative effect of all these savings do you get the true picture of Carset economy. It is a picture that has already changed the entire concept of drilling costs—in mines, quarries, tunnels and construction jobs the country over.

✓ **CHECK THESE FOURTEEN SERVICE-PROVED SAVINGS! EACH ONE IS AN IMPORTANT FACTOR IN CUTTING COSTS PER TON OR YARD OF ROCK BROKEN**

1. Carset Jackbits wear longer
2. Drill faster – 50% or more
3. Boost tonnage 20% or better
4. Consume less drill steel
5. Save up to 30% on dynamite
6. Practically eliminate bit changes
7. Use longer steels
8. Eliminate tapered holes
9. Permit use of lighter drills
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12. Reduce maintenance costs 30% or more
13. Drill the hardest rock
14. Finish more rounds per month

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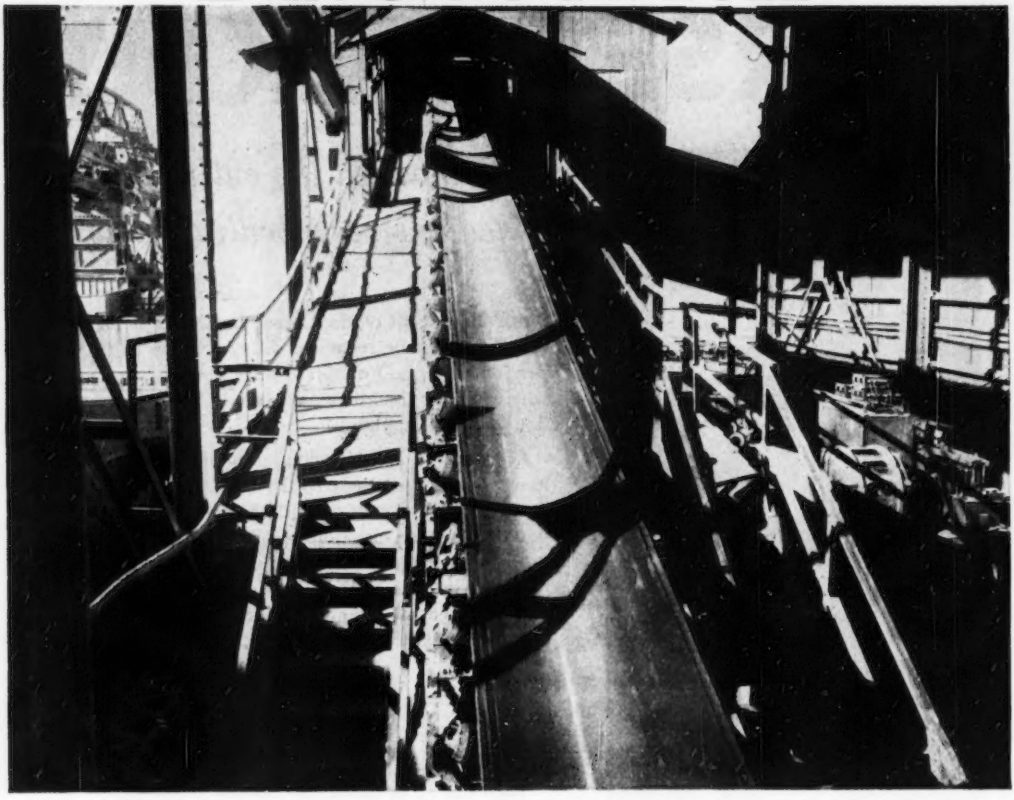
RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER



60 million tons in 11 years B. F. Goodrich belt is still in service

IT HAS cost less than $125 for belt repairs to keep that beltroad in service for 48,000 hours, averaging 12 hours a day, 7 days a week, for 11 years, handling well over 60 million tons of copper ore. It's at the Chile Exploration Company in Chuquicamata, Chile.

This is a B. F. Goodrich belt with *fabric* plies. It has an exclusive flexible edge construction that makes belt travel easily over pulleys, trippers, idlers. Belt conforms to idlers, whether loaded or empty. Every ply ends at belt edge; no folds. With no seams in top or bottom plies, there are no weak spots to cause surface cracks.

But what if your job involves unusual impact loads, where materials drop from a height? Or overloads, long centers, high lifts? The belt for that job is the B. F. Goodrich *cord* conveyor belt. It has two to six times the impact resistance of any fabric belt. All cords are parallel; each cord is completely surrounded and cushioned by rubber. Under impact, cords and rubber stretch together, distorting just enough to send the shock throughout the belt. The same blow might damage a belt that didn't "give" and spread. Ply separation on the *cord* belt is practically impossible. Rubber-surrounded cords are protected from mildew, acid.

There are many other features of B. F. Goodrich conveyor belts — both cord and fabric — designed especially for your conveyor and the material you handle. Many special constructions for special problems. BFG engineers will help you select the best construction, and do everything possible to see that you get conveyor belt service for the lowest possible cost. Write *The B.F.Goodrich Company, Industrial and General Products Division, Akron, O.*

Conveyor Belts BY
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RUBBER FOR INDUSTRY

ENGINEERING AND MINING JOURNAL

84th YEAR OF PUBLICATION

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A McGRAW-HILL PUBLICATION

ABC ABP

Even here...
WIRE ROPE STAYS STRONG LONGER
...when it's protected with TEXACO CRATER

TUNE IN...
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MILTON BERLE
on television
every Tuesday night.
See newspaper for
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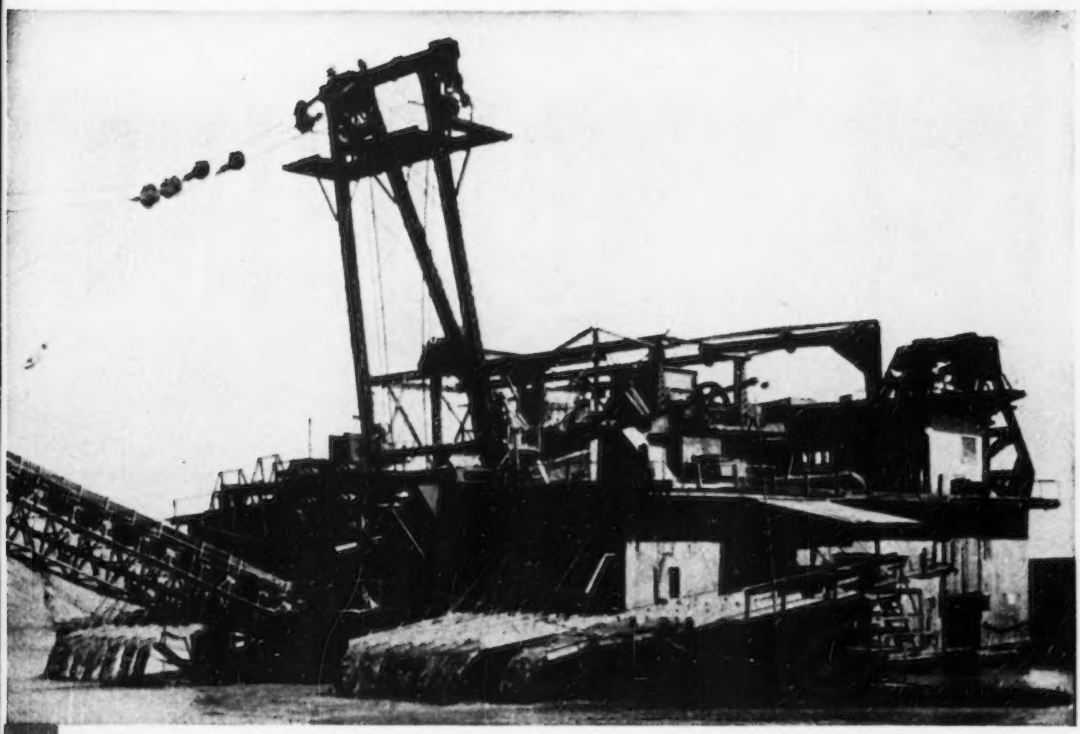
TEXACO

TEXACO



You could hardly devise a tougher test for wire rope lubricant than gold dredging. Rope is continually in and out of muddy water. Yet even in service as tough as this, *Texaco Crater* will keep your rope strong longer.

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To get longer life and better service from your open gears, coat them with *Texaco Crater X Fluid*. You can easily brush or spray it on. The resulting film of protection cushions the gear teeth against shocks and heavy loads, reduces wear and noise. And—*the protection lasts!*

Mines everywhere use *Texaco Craters* and other Texaco Products to reduce their machinery maintenance costs. In fact—

More copper mining equipment in the U. S. is lubricated with Texaco than with any other brand.

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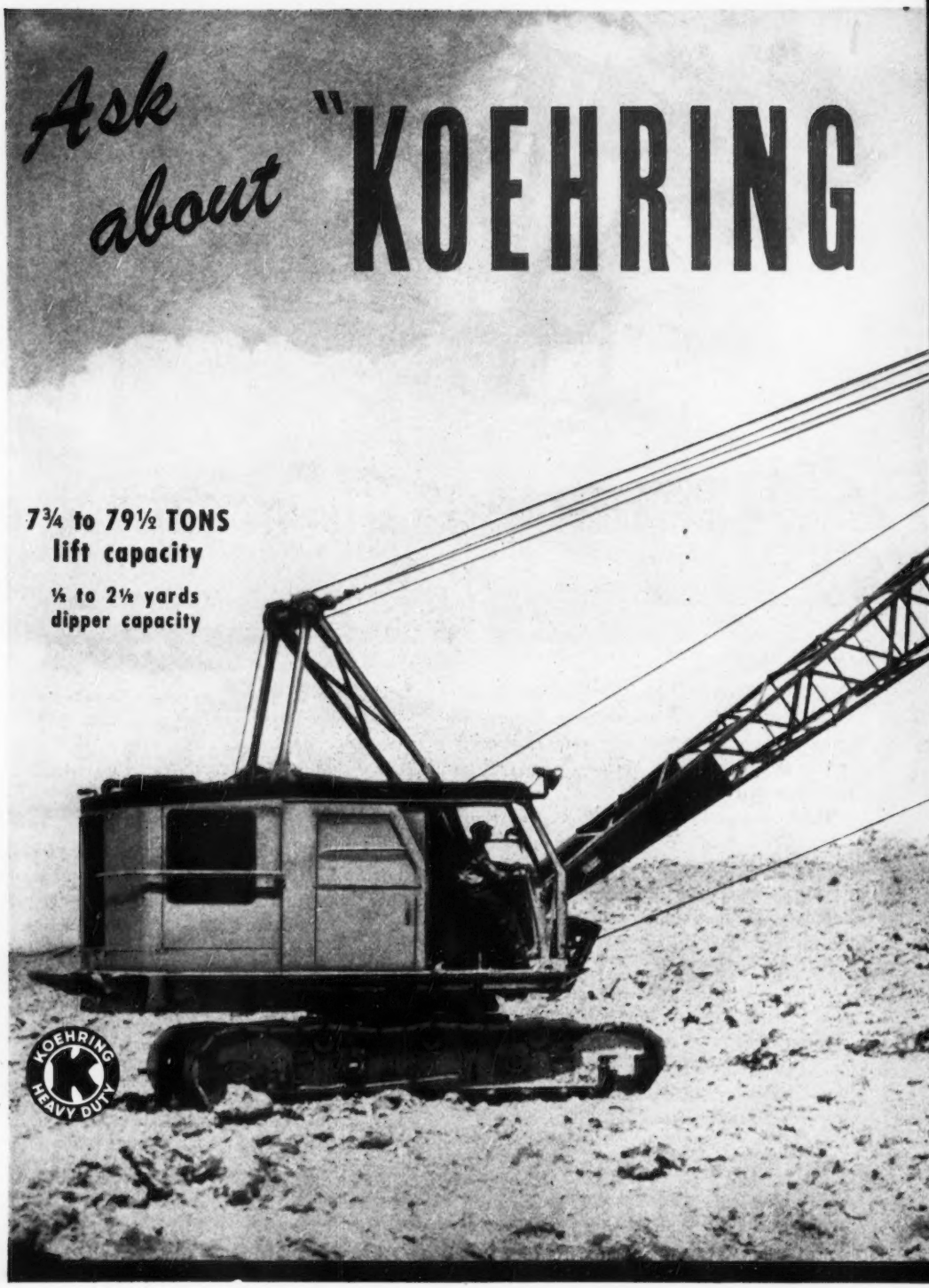
FOR THE MINING INDUSTRY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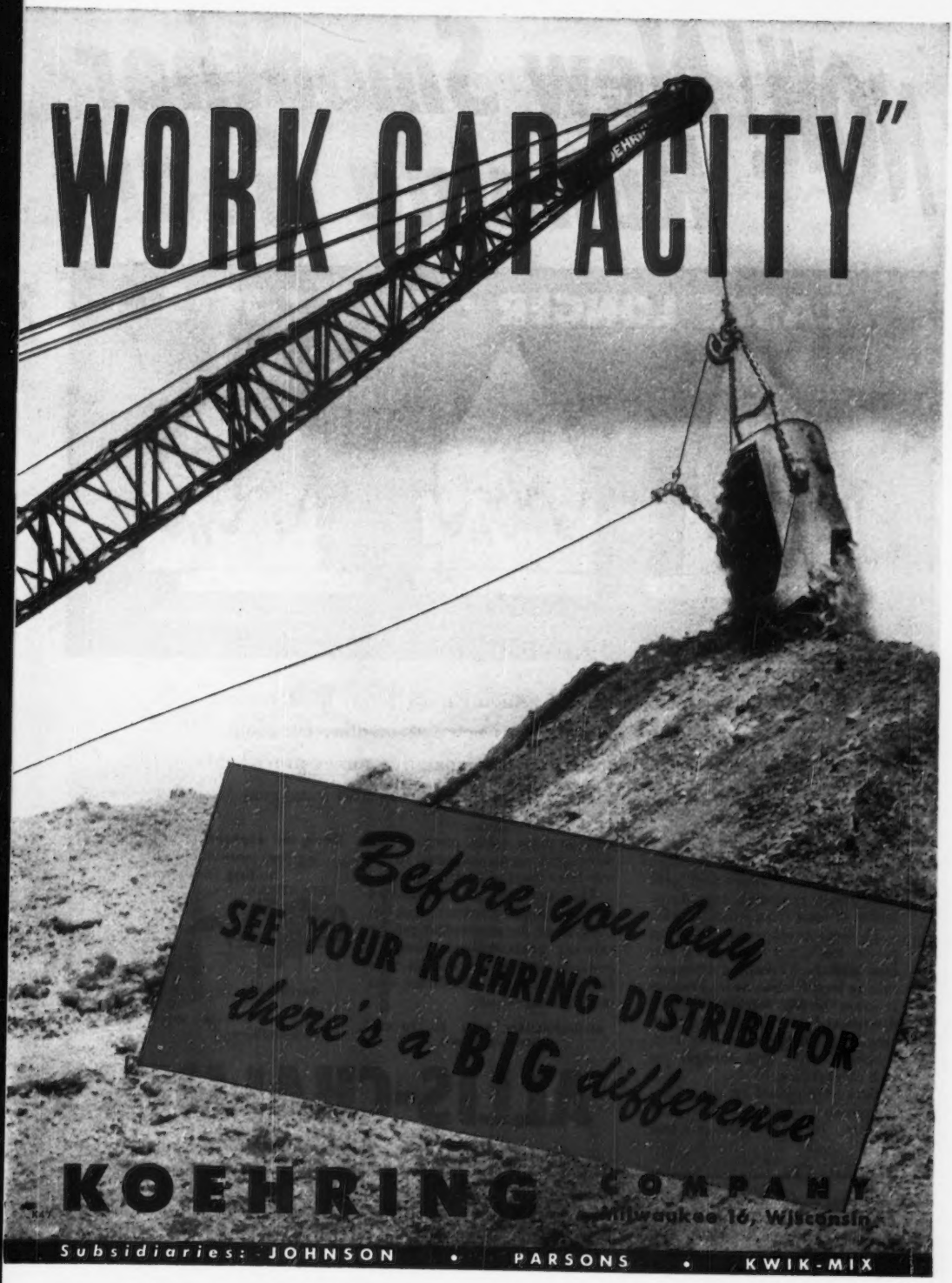
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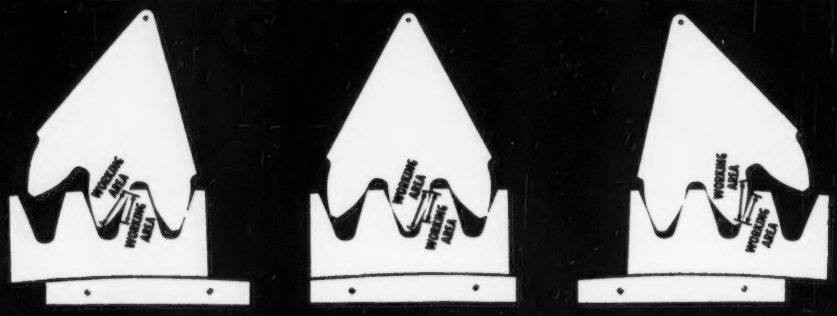
LASTS LONGER • CUTS COSTS



Trailing tooth picks up load before preceding tooth loses contact.

There's more area for tooth contact with 20° long addendum tooth.

No gouging when gear tooth pulls away from pinion.

Big news for operators of grinding mills, rotary kilns, coolers, dryers! Allis-Chalmers offers new 20° involute cut tooth spur gear . . . developed after a comparative survey proved these gears the most effective for smooth operation and long gear life.

HERE'S WHY new 20° involute spur gear with long addendum pinion and short addendum gear tooth results in smooth, even distribution of force from pinion to gear:

1) Gear tooth *rolls* evenly on pinion tooth, not first rolling and then sliding. 2) Rolling action results in least friction wear. Pressure is lower because working force is distributed over 75% more tooth area. 3) Each gear tooth is 25% thicker at base, 25% stronger per inch of gear face.

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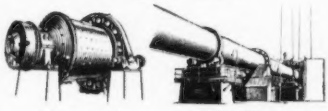

Grinding Mills Rotary Kilns

Also used on rotary dryers, coolers, blade mills, etc.

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Texrope is an Allis-Chalmers trademark. A3130

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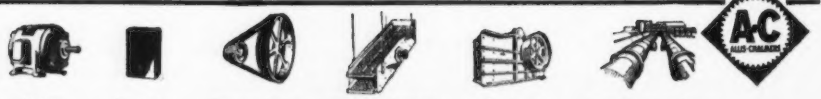

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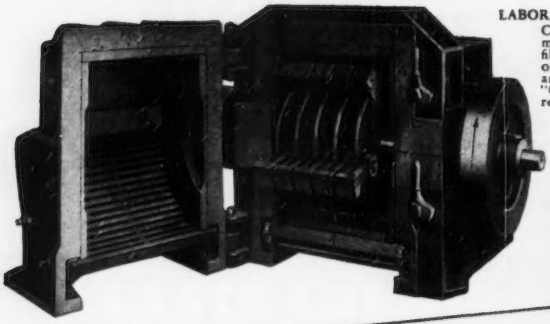

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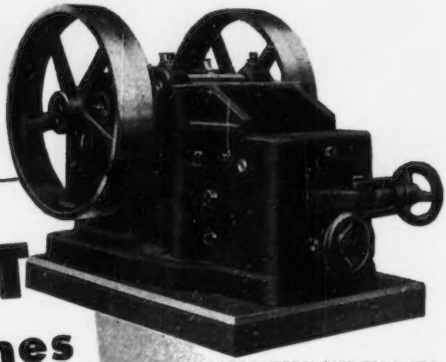
Capable of reducing soft, moderately hard and tough or fibrous materials to any degree of fineness between 1 in. and 20 mesh. The patented "Open-Door" feature permits ready accessibility for cleaning.



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Assure Quality of Products

Fast - Economical - Accurate

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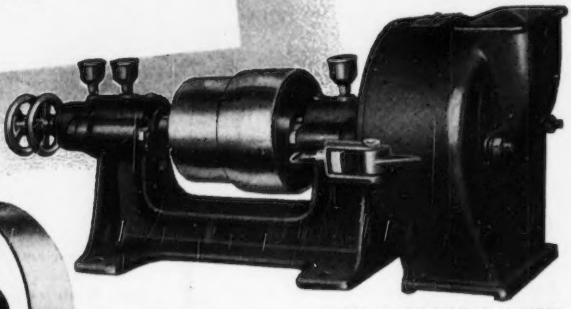
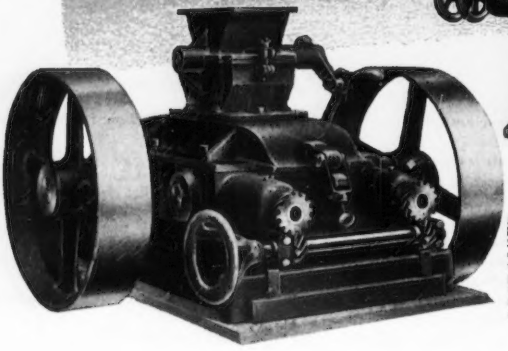
Special Roll Jaw action simplifies close regulation of the product with capacities varying from 300 or 400 lbs. per hour at finest settings, to 1000 or 2000 lbs. when opened for coarser work. Each part of the crusher is accessible for quick and easy cleaning.





LABORATORY CRUSHING ROLLS

First designed especially for laboratory sampling work, Sturtevant Crushing Rolls are used regularly in many plants where there are limited outputs. Range of output for the 8 x 5 size is from ½ in. to 20 mesh — and for the 12 x 12 size from ¾ in. to 20 mesh.

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Laboratory Sample Grinders are of the "Open-Door" disc type and are capable of very fine work, producing products as fine as 100 mesh (coarser if desired) when working on dry, friable, soft or moderately hard materials. Simply turn hand wheel to provide product regulation from 10 to 100 mesh.

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Sturtevant Laboratory Equipment meets the exacting requirements of laboratory work. They are fast and accurate . . . provide true samples.

Rugged and dependable, Sturtevant equipment actually has all the features of full size machines plus extra accuracy and wider range of adjustment. The "Open-Door" accessibility permits quick, thorough cleaning . . . prevents the possibility of previous batches from contaminating new samples.

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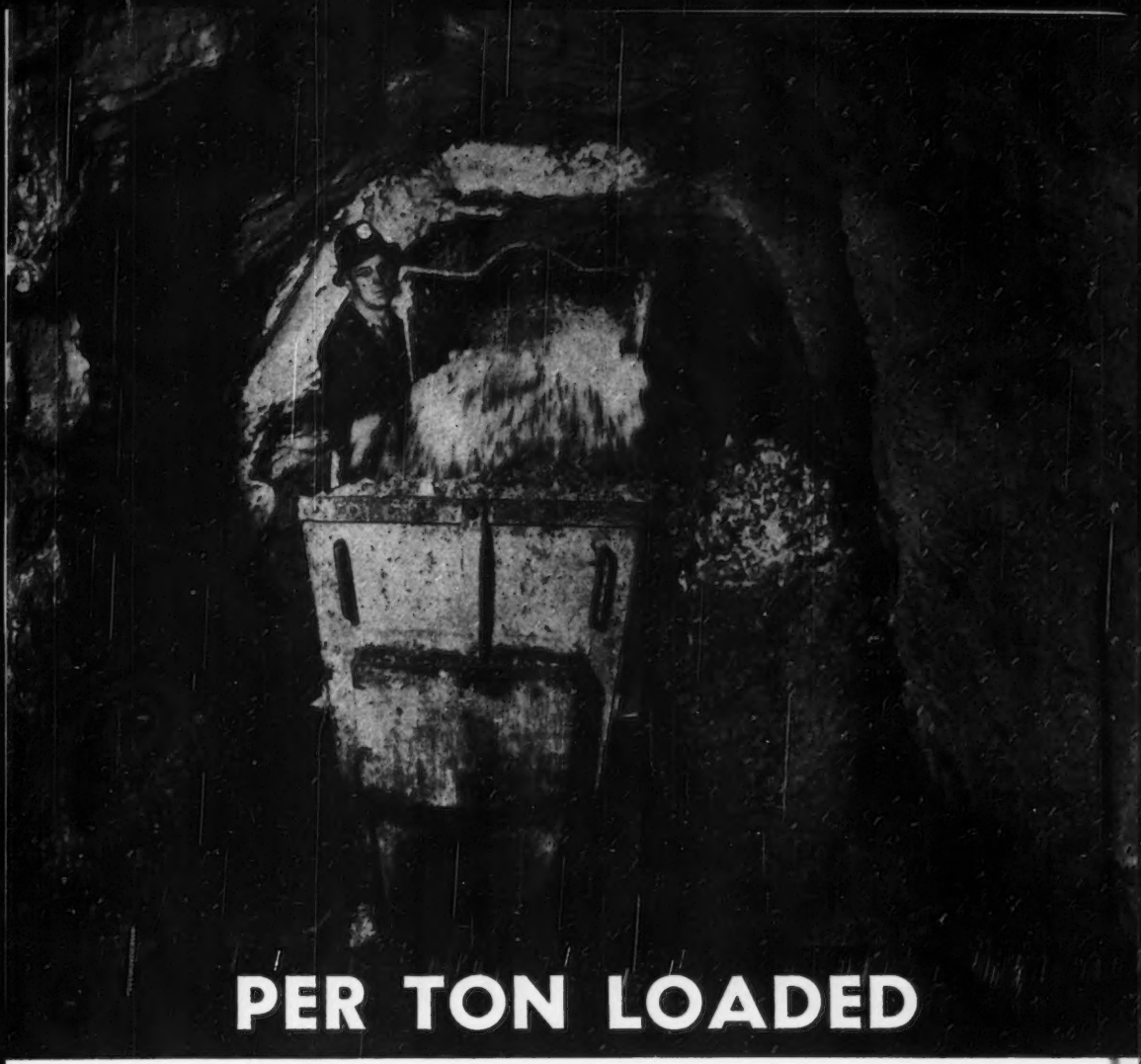

PER TON LOADED

Its the rock loaded that counts and Eimco performance is always quoted on a "per ton loaded" basis.

Eimco RockerShovels are fast and efficient — no useless passes at the muck pile are necessary with Eimco's. Powerful Eimco motors force the RockerShovel into the muck so that the bucket comes up full every time.

Eimco's also have numerous built in safety features — many of them are designed into the machine. Eimco RockerShovels are easier to operate — assuring full production of the operator for each shift.

Insist on Eimco's — They're cheaper on a "per ton loaded" basis.

A265

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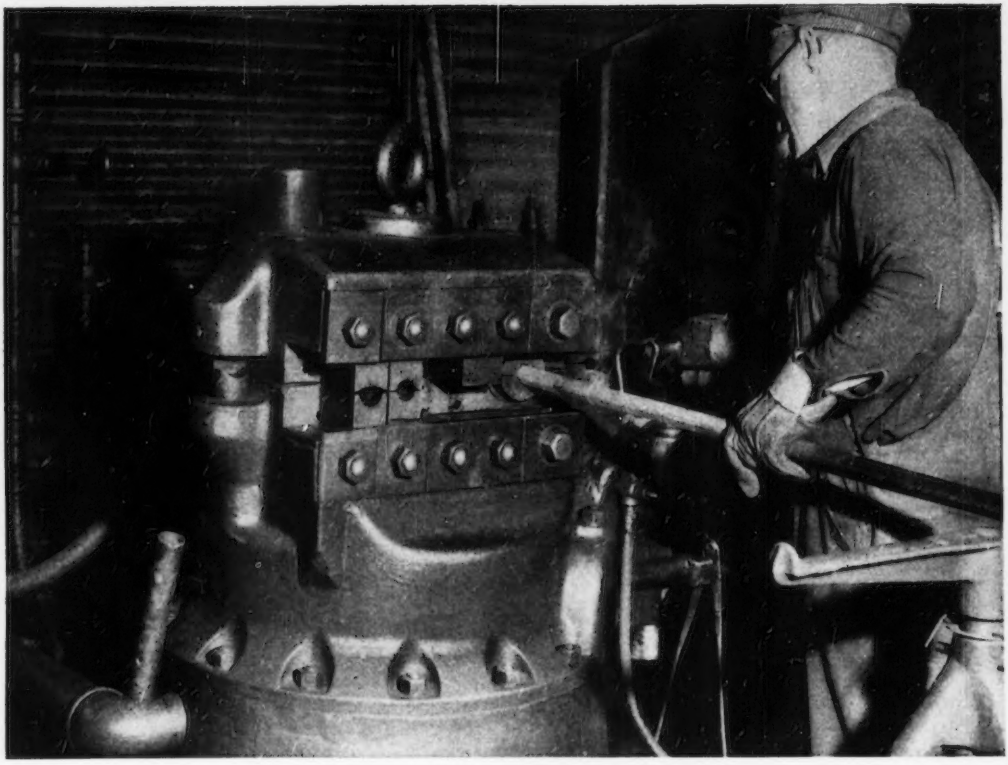

Shanking Bethlehem Hollow at the site of a shaft-sinking project

Let *him* tell you

The sharpener operator can give you plenty of facts about Bethlehem Hollow Drill Steel. He'll tell you, for example, that it's ideal for either forged or detachable bits. He knows it's an easy steel to forge . . . and has a wide quenching range for trouble-free hardening. He'll mention, too, that the smooth center hole offers no starting points for fatigue failure.

The fine performance of Bethlehem Hollow is the result of careful manufacturing and inspection technique. Every bar is tough, fatigue-resisting steel with controlled hardenability and grain size. It's a steel you can rely on to keep costs at rock bottom.

Specify Bethlehem Hollow when you order steel next time. Prompt shipment from your converter or our mill.

SECTIONS AND SIZES

Hexagons	Rounds	Quarter-Octagons
7/8	7/8	7/8
1	1	1
1 1/8	1 1/8	1 1/8
1 1/4	1 1/4	1 1/4
	1 1/2	

Standard lengths up to 45 ft

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only the best for the heart of the job

MAKE YOUR KEY MACHINE A NORTHWEST CRAWLER CRANE

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Split Half a Second into Sixteen Parts . . . *and you get a sensational improvement in blasting methods!*

Here's a picture that shows WHY the ROCKMASTER Blasting System pays off! Notice the rock in motion. And yet the explosive gases are held within the burden. No spectacular "spouts" of gas going to waste. Result: Greater explosives efficiency, better fragmentation, less vibration, greater safety.

In a ROCKMASTER blast, holes are electrically fired at controlled split-second intervals. The timing is in each electric blasting cap. The ROCKMASTER "16" series offers you a choice of sixteen millisecond delay detonators, all starting together, all firing at timed intervals in a little over half a second!

For rock, coal, ore—on the surface or underground

Your job may call for two, three or all sixteen ROCKMASTER detonators. We help you select them to fit your job. Drill pattern and explosives are based on what you want to accomplish. Many times, this means important savings in drilling and dynamite.

Write for your copy of the booklet on the ROCKMASTER "16" Blasting System. It includes diagrams for loading in quarrying, stripping, mining, construction.

Less Bark *More Bite*

ROCKMASTER "16" TIMINGS

Rockmaster No.	Avg. Time of Each Delay from Zero (milli-seconds)
0 (zero)	0 (inst.)
1	8
2	25
3	50
4	75
5	100
6	125
7	150
8	175
9	200
10	250
11	300
12	350
13	400
14	450
15	500
16	550

ROCKMASTER: Reg. U. S. Pat. Off.

ATLAS EXPLOSIVES *"Everything for Blasting"*

CHEMICALS ATLAS EXPLOSIVES

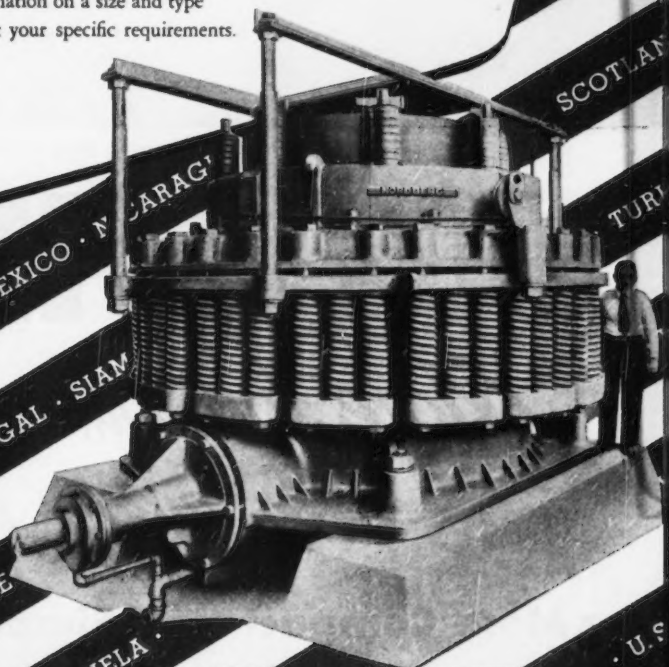
ATLAS POWDER COMPANY, Wilmington, Del. • *Offices in principal cities* • *Cable Address—Atpowco*

Symons Cone Crushers

PREDOMINATE in fine reduction crushing

the world over . . .

SUCCESSFUL operators recognize the superiority of Symons Cone Crushers. The great number of repeat orders Nordberg receives from major producers of ores and industrial minerals in practically every country in the world is evidence of the dependable performance of Symons Cones . . . the crushers that produce greater quantities of finer products at lower cost. Write for detailed information on a size and type to meet your specific requirements.



NORDBERG MFG. CO.
MILWAUKEE 7, WISCONSIN
SAN FRANCISCO · SPOKANE
LONDON · JOHANNESBURG

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NORDBERG

Machinery for processing ores and industrial minerals

PRIMARY CRUSHERS

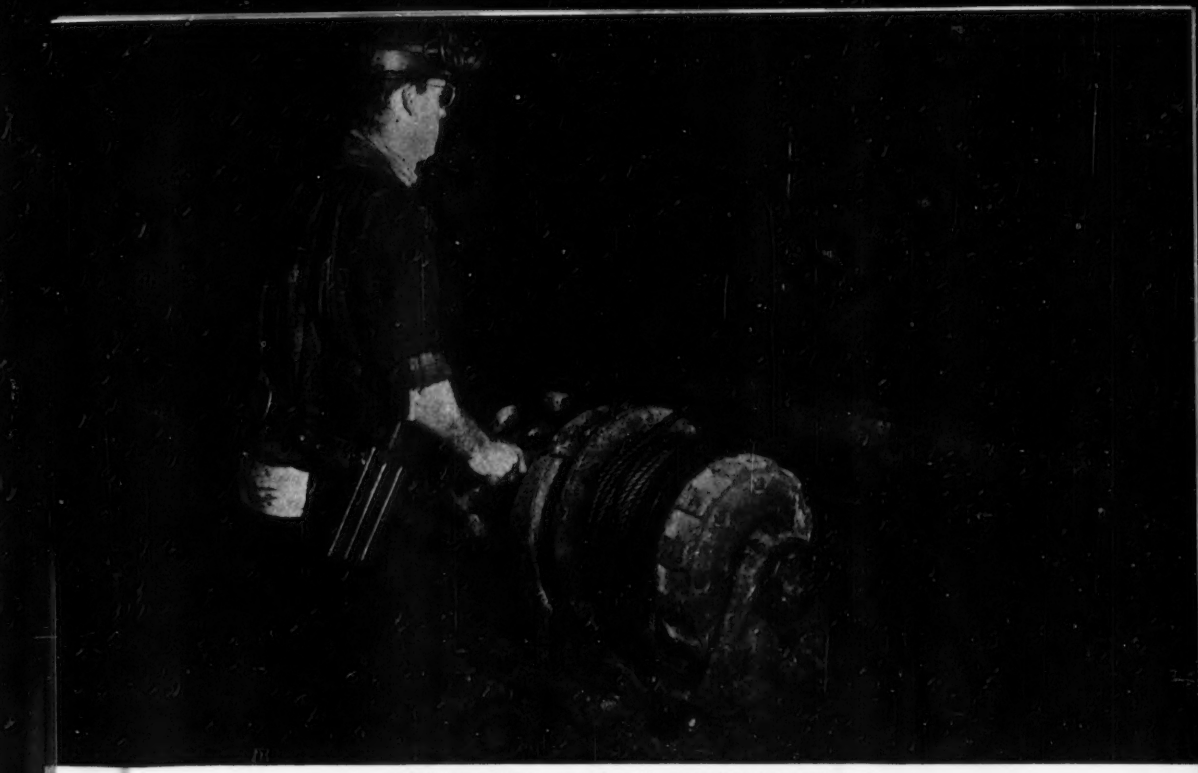
VIBRATING

ROD DECK SCREENS

GRINDING MILLS

MINE HOISTS

DIESEL ENGINES

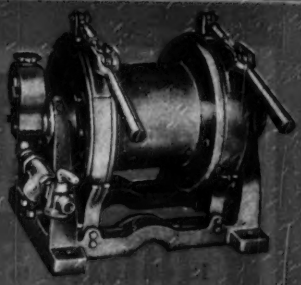


JOY L-111 Hoist, powered by JOY's reversible "Pistonair" Motor

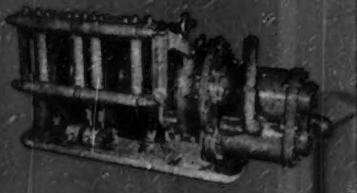
JOY *SINGLE DRUM* HOISTS

More for your money in every way!

- ★ **More Compact**
- ★ **Lighter Weight**
- ★ **Greater Power and Efficiency**
- ★ **Simpler Operation**
- ★ **Easier Installation**
- ★ **Greater Endurance**
- ★ **Minimum Maintenance**



Above, JOY B-112 Hoist, with a 5 H.P. JOY exclusive "Turbinair" motor. Can be mounted on a car, timber, caisson or bar for every type of hoisting job.



Above, JOY FF-211 Slusher, for all-purpose scraping jobs. Illustrated with 10 H.P. "Turbinair" motor, but features inter-changeability of drives to suit conditions.

Left, JOY AW-80 Air Winch, a compact, rugged, flexible hoist for every small job. Weighs only 85 lbs., will lift 500 lbs., is powered by reversible piston-type motor.

JOY C-111 heavy-duty Shaft Hoist, with a 50 H.P. slip ring motor. Can be diesel-driven if desired. Lifts 5000-6000 lbs. at speeds up to 300 ft./min.

Specify "JOY"

for every HOIST or SLUSHING JOB

. . . air-powered or electric

WRITE FOR BULLETIN, OR

Consult a Joy Engineer

W&D M2439

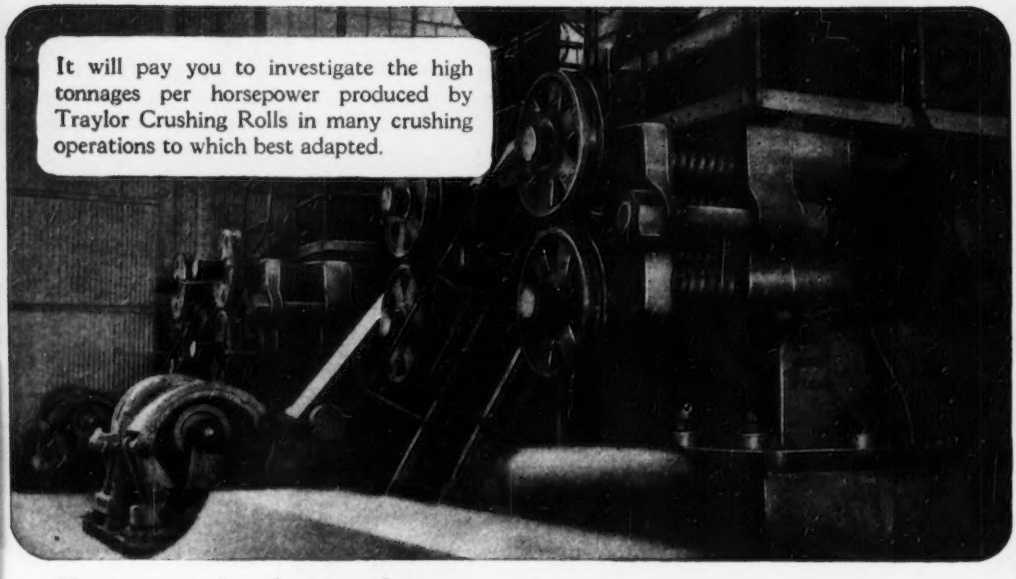
JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.

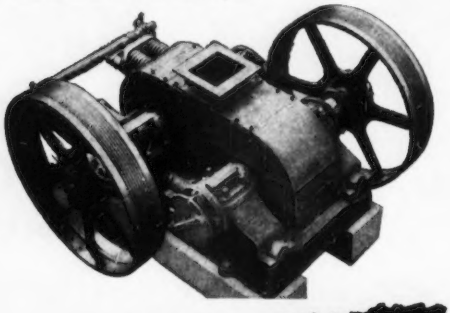
IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, GALT, ONTARIO

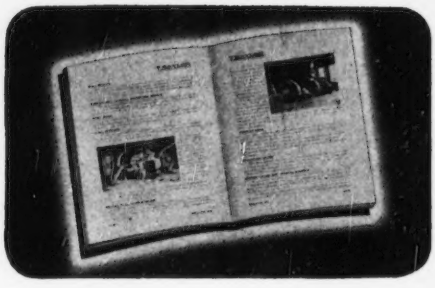
Great Producers

. . . with Low Power Requirements


It will pay you to investigate the high tonnages per horsepower produced by Traylor Crushing Rolls in many crushing operations to which best adapted.

Here are actual performance figures - - Traylor 78" x 20" Rolls (main illustration) operated by a large mining company, consistently crush primary feed of 310 t.p.h. plus 180% circulating load to 52% minus 8 mesh. And have done so for a long time. A pair of smaller rolls, 36" x 16" and 42" x 16" consistently runs 125-150 t.p.h. to ⅛"-3/16". They then reduce oversize, which has been screened out, to 6 mesh at a rate of 120 t.p.h.





Traylor Crushing Rolls are made in three types and thirty-three sizes to meet the requirements of all operations. Bulletin 4637 contains descriptions and specifications of all types and sizes. Write for your copy today.

TRAYLOR ENGINEERING & MANUFACTURING CO.
198 Mill St., Allentown, Pa.

Sales Offices: New York, N. Y., Chicago, Ill., Los Angeles, Calif.
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Rotary Kilns, Coolers and Dryers
Grinding Mills · Crushing Rolls
Jaw, Reduction and Gyratory Crushers

A "TRAYLOR" LEADS TO GREATER PROFITS

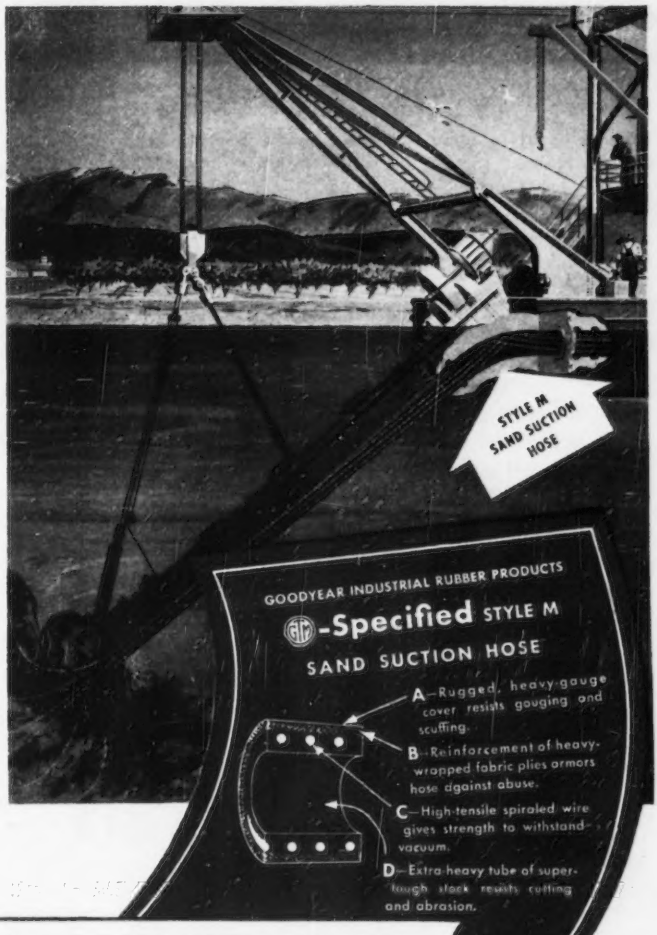
SIX YEARS' SERVICE
Handling highly abrasive sand

Goodyear Dredging Hose Still Going Strong!

ROLLING down the rivers into San Francisco Bay there's a constant flow of highly abrasive grit, gravel and sand. This sedimental glacier would soon bar the rivers to navigation except for constant dredging, handled for the most part by suction dredges.

Back in '44, the G.T.M.—Goodyear Technical Man—specified a length of Goodyear Style M Sand Suction Hose for one of these dredges. After gulping its gritty diet for six years, this hose was examined recently—found to be in shape to handle tons of sand and gravel for years to come.

Whether your hose job is handling abrasives like sand, cement, ceramic materials—corrosives, oils, paints, or live steam—only *one* hose construction has the right combination of synthetic or natural rubber tube, reinforcement materials and covering to give you the longest, lowest-cost hose service. So turn to the man who knows hose best—the G.T.M.—for recommendations for your needs. Or write Goodyear, Akron 16, Ohio.


STYLE M SAND SUCTION HOSE
GOODYEAR INDUSTRIAL RUBBER PRODUCTS
GIR-Specified STYLE M
SAND SUCTION HOSE
A—Rugged, heavy-gauge cover resists gouging and scuffing.
B—Reinforcement of heavy-wrapped fabric plies armors hose against abuse.
C—High-tensile spiraled wire gives strength to withstand vacuum.
D—Extra-heavy tube of super-tough stock resists cutting and abrasion.

FOR HOSE, FLAT BELTS, V-BELTS, MOLDED GOODS, PACKING, TANK LINING built to the world's highest standard of quality, phone your nearest Goodyear Industrial Rubber Products Distributor.

GOODYEAR

THE GREATEST NAME IN RUBBER

2 GREAT NEW ADDITIONS

DW20 TRACTOR
W20 WAGON

DW21 TRACTOR
NO. 21 SCRAPER

TO THE "CATERPILLAR" LINE

—TO BRING YOU STILL GREATER EARTHMOVING CAPACITY AND SPEED

Accompanying the Tractor features generalized (below, right) the Wagon member of this big-capacity unit offers:

17 cu. yds. capacity, struck; 25 cu. yds., heaped.

Travel speeds, through tractor's 5 gear ratios, ranging from 2.88 to 26.6 m.p.h.

Generous size hopper to provide good target for shovel or dragline loading.

Controlled dumping . . . openings can be varied without mechanical adjustment—permitting either dumping or windrowing.

Accurate hydraulically controlled dumping with positive mechanical lock on dump doors.

THE DW20 TRACTOR AND NO. 20 SCRAPER UNIT

The "Cat" No. 20 Scraper is available also for the DW20 Tractor. It has the same capacity and general specifications (except in type of gooseneck) as the No. 21 Scraper described below.

THE ENGINE: ***Both prime movers have the new 6-cylinder "Cat" Diesel Engine . . . 275 HP. peak capacity at 2,000 r.p.m. tested in accordance with A.S.M.E. Power Test Codes; 225 HP. at 1,900 r.p.m. available at the flywheel.***

Accompanying the Tractor features generalized (right), the 2-wheel DW21 offers:

Full 90° turn each way.

Travel speeds, through 5 gear ratios, ranging from 2.16 to 20 m.p.h.

Scraper capacity is 15 cu. yds., struck; 19½ cu. yds., heaped. (With available 12″ extensions, 18 cu. yds., struck; 22½ cu. yds., heaped.)

Bowl and apron are designed to promote "boiling" action of earth through center of load—for full-measure yardage and minimum loading time.

Large low-pressure tires for easy load flotation.

'Dozer-type ejection for positive "kicking out" of sticky material; dependable spring-action ejector return.

Open bowl design to permit visible loading under shovel or dragline.

Adjustable rear axle to permit level cuts and desired settings.

Double bottom of special alloy steel. Self-sharpening reversible cutting edge.

High apron lift, low center of gravity.

FOR high-speed hauling . . . for high production . . . "Caterpillar" offers two new hauling and digging units—the 4-wheel DW20 and the 2-wheel DW21.

With a completely new 6-cylinder Diesel Engine producing 225 HP. available at the flywheel, the newcomers give users their choice of high-speed wheel-type prime movers.

The DW20, with top speed of 26.6 m.p.h., has 2 design matched trailed units . . . the "Cat" W20 Wagon (25 cu. yds. heaped capacity) and the "Cat" No. 20 Scraper (19½ cu. yds. heaped capacity).

The DW21, with top speed of 20 m.p.h., trails the "Cat" No. 21 Scraper (19½ cu. yds. heaped capacity).

And, as always, "Caterpillar" quality, dependability, durability and work capacity are built in . . . backed by the unparalleled parts and service facilities of the world-wide "Caterpillar" dealer organization.

For further information on these two new units, contact your dealer or write the factory.

CATERPILLAR TRACTOR CO. • PEORIA, ILLINOIS

TRANSMISSION

Constant-mesh transmission, and heavy-duty clutch. Special locking device that prevents gears from becoming disengaged.

BRAKES

Each large, heavy-duty brake is 22″ in diameter, 7″ wide. Compressed air energized brakes on both tractor and drawn member of unit. Handy control valves for applying both sets of brakes, and to right or left driving wheel.

STEERING

Hydraulic booster steering that follows the natural "feel of the road" hand guidance. Heavy steel stops for keeping gooseneck of drawn equipment from jackknifing.

OPERATOR COMFORT

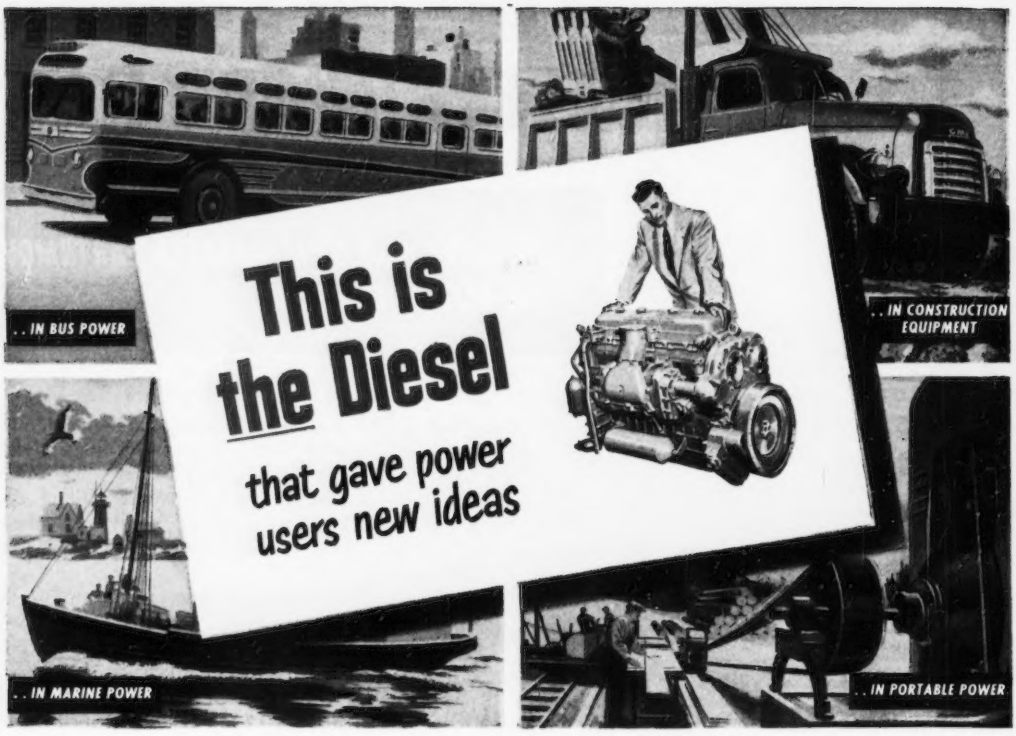
Airfoam rubber cushion on bucket-type seat mounted on coil spring with hydraulic snubber. All controls within easy reach. Excellent visibility.

CATERPILLAR

REG. U. S. PAT. OFF.

DIESEL ENGINES • TRACTORS

MOTOR GRADERS • EARTHMOVING EQUIPMENT



This is the Diesel

that gave power users new ideas

SHOW an engineer a better source of power and things start happening fast.

That's illustrated by events since General Motors first introduced the "71" Series of two-, three-, four- and six-cylinder Diesel engines, ranging from 50 to 200 horsepower—little brothers of the famed two-cycle GM Diesels that drive so many crack American passenger and freight trains.

Bus engineers went for the "71" at first sight. They liked its compactness, its fuel economy, its clean-burning operation. Now more than 20,000 city and inter-city buses are powered by GM "71" Diesel engines.

Army and Navy engineers approved its rugged strength and dependability. During the war they used 182,000 GM "71" Diesels to operate landing craft, tanks, tractors, bulldozers and other military vehicles.

So, too, have designers of all types of power-driven equipment turned to the GM "71" for low-cost efficient power. Today they are using it in heavy-duty trucks, tractors and earth movers, in work and pleasure boats, in cotton gins, lumber mills, oil rigs and for many other mobile, portable and stationary uses—*with remarkably successful results!*

That is because the GM "71" is a two-cycle engine that delivers power on every piston downstroke—in contrast to most Diesels that deliver power only on every second downstroke. This makes GM Series 71 Diesels more compact, lighter, faster-accelerating, smoother, cleaner-burning—*and twelve years' experience in applications totaling over 46,000,000 horsepower proves it!*

The GM "71" gives you Diesel brawn without the bulk. *It is Diesel power at its best.*

DETROIT DIESEL ENGINE DIVISION

SINGLE ENGINES . . . Up TO 275 H. P. **DETROIT 28, MICHIGAN** MULTIPLE UNITS . . . Up TO 800 H. P.

GENERAL MOTORS

GM GENERAL MOTORS DIESEL POWER

"Your Key to Power Economy"

Only GM Diesels provide all these advantages

Smaller size, less weight per horsepower • Two-cycle smoothness, power on every downstroke • Quick starting, on its own fuel • Unit injectors—no high-pressure fuel lines • Rapid acceleration • Cleaner burning • Better high-altitude performance • Easy accessibility

Superior Stone Company Reports
J & L JALLOY Heat-treated Steel
SAVES $200 PER TON installed

J&L STEEL

Center—*Superior Stone Company's Red Hill Quarry, showing screening, crushing and loading units.*

Left and right—*Jalloy heat-treated plates used extensively at Red Hill in chute liners and truck bottoms.*

Heat-treated Jalloy Chute and Truck Liner Plates Give 3 Times Longer Service at Superior's Operations

Superior Stone Company is cutting maintenance costs and increasing service life of equipment by standardizing on J & L JALLOY heat-treated plate for chute and truck body plates.

Typical of Superior's eight operations in Virginia and North Carolina is the large Red Hill, Virginia, quarry. Records at Red Hill show that J & L heat-treated Jalloy has a service life *generally three times longer than mild steel.* This means that for every ton of heat-treated Jalloy Superior Stone Company uses to replace mild steel, $140.00 is saved in cost of steel and $60.00 is saved in man hours spent for maintenance of chutes and truck bodies. **A total savings of $200 per ton of Jalloy installed.**

The result—J & L Jalloy is now installed as side and bottom liners in all chutes at Red Hill Quarry, in truck bodies and in several other miscellaneous applications.

Manufacturers and maintenance men alike have found that a yield strength 4 times that of mild steel and a Brinell hardness 4 times as great make heat-treated Jalloy an ideal steel for use in such applications as — Bulldozers — Scrapers — Rock Crushers — Shovel Buckers — Dump Cars—Truck Bodies—Chutes and Sand Blast Equipment.

If abrasion and impact are limiting the life of your equipment—and causing high maintenance costs—why not write for the booklet, "For Longer Wear, Less Repair"? It will give you the facts on J & L heat-treated Jalloy and how others are saving money with this modern mining and quarrying steel.

JONES & LAUGHLIN STEEL CORPORATION

From its own raw materials, J&L *manufactures a full line of carbon steel products, as well as certain products in* OTISCOLOY *and* JALLOY *(hi-tensile steels).*

PRINCIPAL PRODUCTS: HOT ROLLED AND COLD FINISHED BARS AND SHAPES • STRUCTURAL SHAPES • HOT AND COLD ROLLED STRIP AND SHEETS • TUBULAR, WIRE AND TIN MILL PRODUCTS • "PRECISIONBILT" WIRE ROPE • COAL CHEMICALS

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412 Jones & Laughlin Building
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Please send me a free copy of your booklet, "For Longer Wear, Less Repair—Jalloy—J & L Special Alloy Steel."

Name_____

Company_____

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WALWORTH LUBRICATED PLUG VALVES

offer these advantages

- ...Direct port opening
- ..Quarter turn opens or closes valve
- ...Dead tight shut-off
- ...Freedom from attack by fluids being handled
- ...Pressure sealed
- ..Made in a complete line. Sizes from ½" to 26" for pressures from 175 to 5,000 psi., and for vacuum requirements

THESE are just a few of the reasons why Walworth Lubricated Plug Valves give "top" performance on many *difficult* services.

All Walworth Lubricated Plug Valves employ special insoluble lubricants which protect the plug and body against contact with the line fluid, thus combatting erosion and corrosion.

The lapped surfaces of the valve are "pressure sealed" when the valve is in either the open or closed position. By turning the lubricant screw, lubricant is forced under high pressure through a grooving system that completely encircles the ports as well as the top and bottom of the plug.

The lubricant seals the valve against leakage, and reduces friction between plug and body. This permits easy, quick, full-opening, or tight shut-off with only a quarter turn of the plug.

Number 1700 (illustrated) is a Steel-iron valve, wrench operated, designed for a working pressure of 200 pounds WOG (water, oil, or gas). Valves are available in either screwed or flange types. Screwed type have API line pipe thread lengths. Flanged type (No. 1700F) is faced and drilled to American Standard for 125-pound cast iron flanges unless otherwise specified.

For further information about No. 1700 as well as the complete line of Walworth Lubricated Plug Valves, write for catalog.

WALWORTH

valves and fittings

60 EAST 42nd STREET, NEW YORK 17, N. Y.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

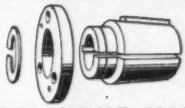
4 BIG ADVANTAGES!

ONE PIECE MOUNTING

Bushing and sheave go on together. One motion mounting. Alignment is easier. Sheave is on right first time.

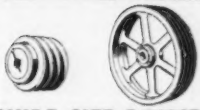
POSITIVE DRIVE

Bushing is keyed to both shaft and sheave. No slipping. No sheared screws. No jammed bushings from bent screws.



FULL CIRCLE GRIP

Bushing split full length with separate collar. Grips shaft full length around full diameter. No forcing or distortion. Grip easily broken. No hammering.



WIDE SIZE RANGE

Magic Grip sheaves are available from 3" pitch diameter up. Style NC bushing for smaller sizes and Style C bushing for larger sizes.

MAGIC GRIP SHEAVE

YOU CAN MOUNT a *Magic Grip* sheave faster than any other sheave you can buy . . . and demount it just as fast. When you mount a *Magic Grip* sheave it runs true. It will not slip or jam. It always comes off easily.

Even if you don't change sheaves often, you should have *Magic Grip* sheaves on every drive to eliminate the possibility of shaft and bearing damage when ordinary sheaves are hammered or pried on or off.

WIDEST V-BELT LINE

Get everything you need for your V-belt drives from one reliable source. *Texrope* offers the broadest line of V-belts, standard and variable speed sheaves and speed changers in the industry. And you also get the extra engineering skill that comes from having more industrial V-belt installations than any other manufacturer.

Get your copy of the 144 page *Texrope* Pre-Engineered Drive Manual from your A-C Authorized Dealer or Sales Office or write for Bulletin 20B6956.

A-3022

ALLIS-CHALMERS, 969A SO. 70 ST.
MILWAUKEE, WIS.

Sold . . .
Applied . . .
Serviced . . .

by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.

MOTORS — ½ to 25,000 hp and up. All types.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

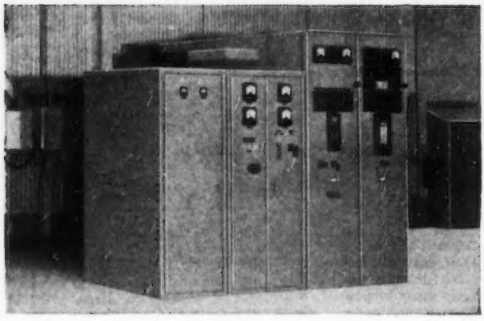
PUMPS — Integral motor and coupled types from ¾ in. to 72 in. discharge and up.

Texrope and *Magic Grip* are Allis-Chalmers trademarks.

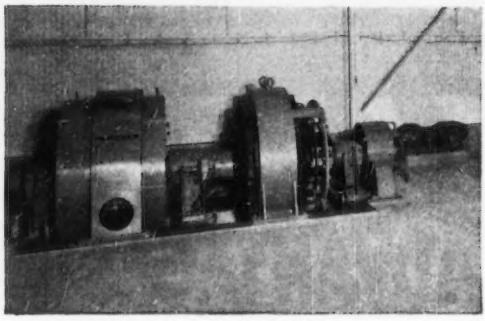
A-C ALLIS-CHALMERS

ALLIS-CHALMERS

AUTOMATIC HOISTING for continuous tonnage!



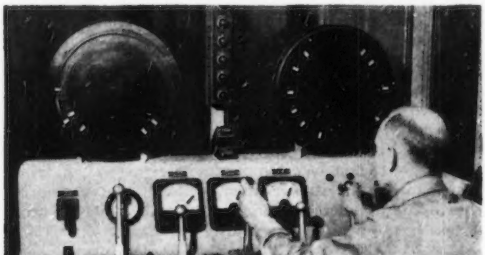
Completely metal-enclosed for personnel safety, this control cubicle houses the synchronous motor switchgear panel, plus Ward Leonard type d-c control equipment. Less space requirement and simplified control result from use of the G-E amplidyne, which eliminates need for many contactors and relays, while permitting the retention of safe limits on the hoist's acceleration and deceleration.



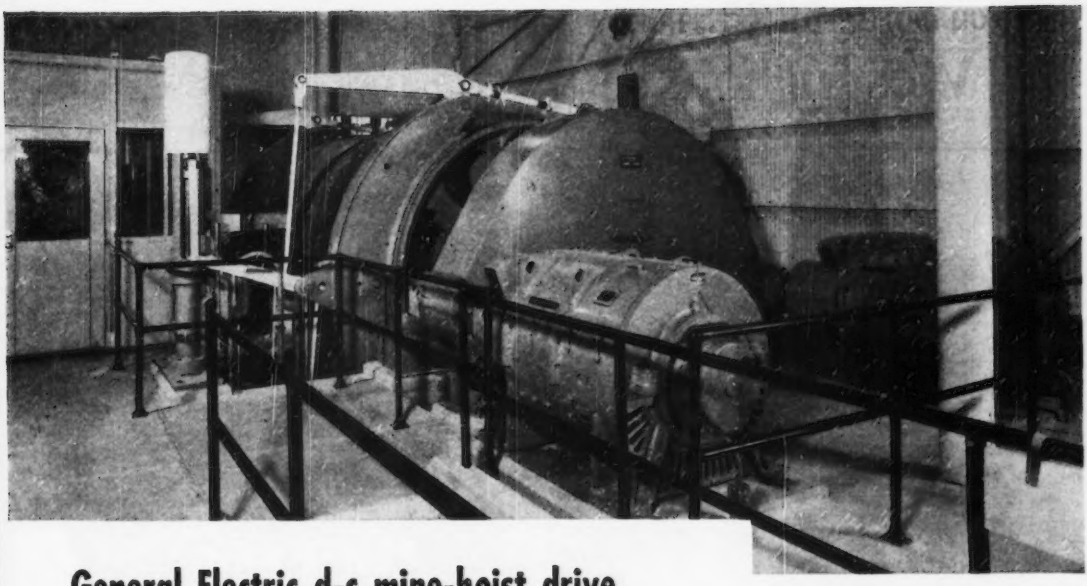
Converting a-c to d-c, this G-E motor-generator set comprises a 750-kw generator, an 1100-hp synchronous motor, and a 20-kw exciter. The generator supplies adjustable-voltage power for the operation of the two hoist motors. At right, the G-E amplidyne, used as an exciter for this generator, provides superior operation and more positive limits of acceleration and deceleration, for greater safety, increased production.

MINE-HOIST DRIVES

—to cut mining costs!



When necessary for inspection, testing, or man-trips, control of the hoist can quickly be switched from automatic to the manually operated master controller as above. Adequate starting, stopping, and maneuvering of the skips with ease, precision, and safety is provided by the optional manual operation. With the normal automatic operation, the duties of the operator may be chiefly of another nature.



This automatic mine hoist is powered by a complete G-E drive that includes two 500-hp d-c motors. When the skip at the shaft bottom is fully loaded, it starts and accelerates to full speed. Near the dumping pocket, it automatically slows down, eases through the dumping horns, and makes a dead stop at the final limit of travel, thus completing the entire cycle automatically.

General Electric d-c mine-hoist drive with amplidyne control permits continuous output at 8 tons per minute, simplifies operation, increases safety, prolongs equipment life!

Here is another General Electric amplidyne-controlled d-c mine hoist drive helping to boost output and cut costs—in this case in a New Mexico potash mine.

This high-speed high-tonnage hoist raises in balance an 8-ton payload every minute up an 1150-foot shaft at speeds up to 1500 fpm. The hoist runs fully automatically throughout the entire shift, and may also be run by push-button control operated by the skip loader at the loading level.

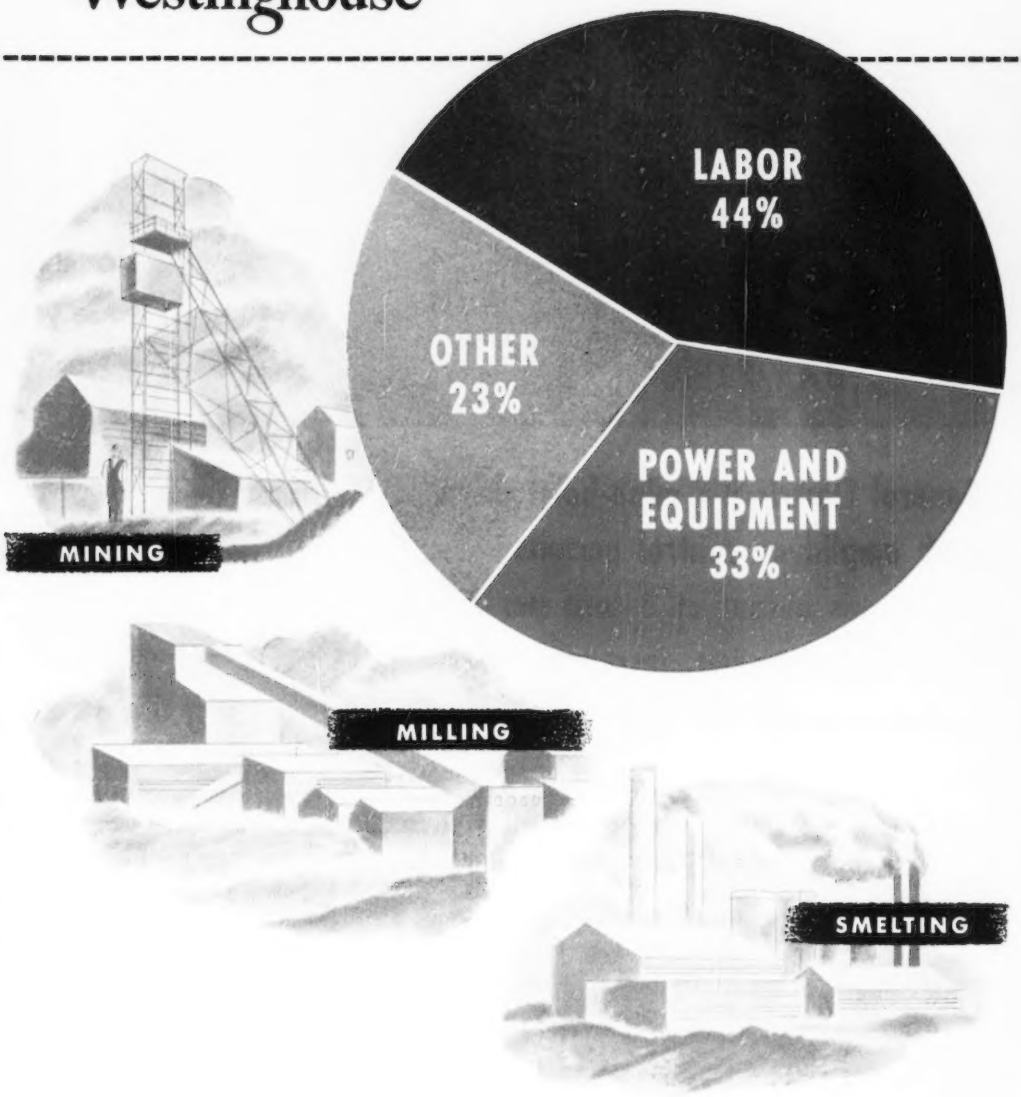
Because it is completely automatic, this continuous, highly efficient operation permits hoisting maximum tonnage per man-hour. Hoist speed is closely maintained in spite of load variations, repetitive operation helps cut costs per ton, and personnel may be freed for other duties. Electric braking provides greater safety and prolongs the life of the hoist mechanism.

Applicable for any type of mining, this installation is further evidence of G-E experience in engineering automatic mine-hoist drives, experience that dates back to 1915. Let a G-E mining specialist put this experience to work on *your* mine-hoist problems. Call him at your nearest G-E office. Meanwhile, send for Bulletin GET-1430. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

GENERAL ELECTRIC

660-22

YOU CAN BE **SURE**.. IF IT'S
Westinghouse



EVERYTHING ELECTRICAL TO MINE ANYTHING

Have you studied your whole cost picture?

Labor is just one of your big cost items. Power and machinery themselves average 33% of the cost of mining ore.* Westinghouse can help you keep these costs in line—*because your electrical equipment has a major effect on them.*

Equipment Affects Basic Power Costs

In the first place, look at your actual power costs. Your power *distribution system* determines how much of the power you buy actually goes to work. A good system minimizes transmission losses and saves you money. And if you make your own power, the proper application of your generating apparatus will have a big effect on the balance sheet.

Influences Machine Efficiency

Perhaps even more important is the effect your electrical equipment has on machine efficiency—the return on your machine cost dollar. When the distribution system is right, voltage is properly maintained and motors deliver full rating. Drills, hoists, grinders, crushers, concentrators run as they're designed to. And they stay running without costly shutdown when their driving motors are carefully selected and power supply is dependable.

Equipment Itself Is Cost Factor

Finally, maintaining and replacing the electrical equipment itself can be a big factor on your books. If it's properly designed, properly built and properly *co-ordinated,* it is more efficient, runs longer and needs less attention.

Westinghouse Experience Can Help You

Building and co-ordinating electrical equipment to do the *best job* for your particular operation takes plenty of experience on the part of your engineers and your electrical manufacturer. For over 50 years Westinghouse has been helping the mining industry solve its electrical problems—and we've learned from experience how to meet *your particular needs.*

Westinghouse can supply the complete electrical equipment for your job. This simplifies your problems and, most important, you know the equipment is designed for strenuous mining service and designed to work together for maximum efficiency.

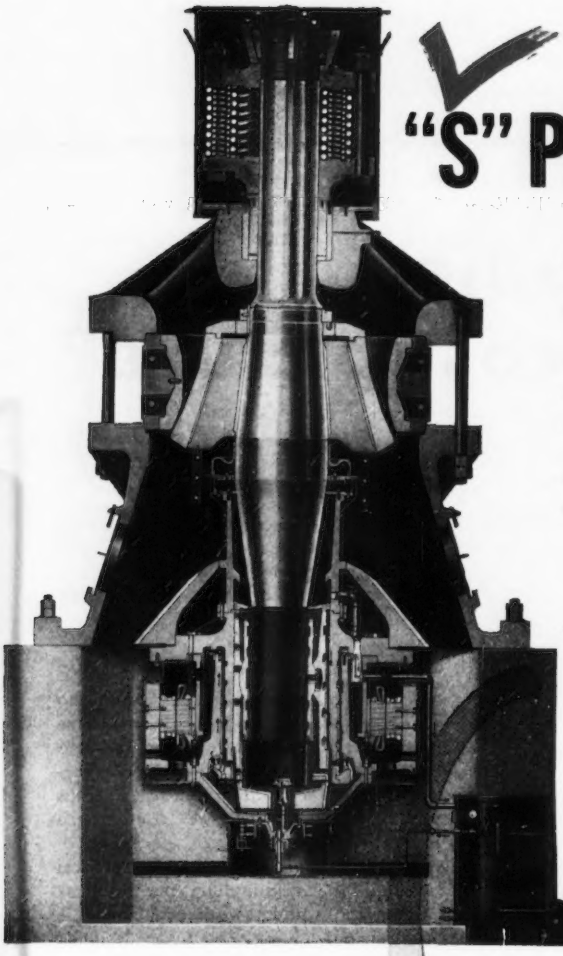
Let us help you review your present electrical setup now to be sure *all* of your production team is on the job. Just call your nearby Westinghouse office. And on future installations call in Westinghouse early in the planning stage. J-94849

*Typical 1000-ton/day mine

Westinghouse

EQUIPMENT FOR THE MINING INDUSTRY

CHECK TYPE "S" PERFORMANCE



Location: **Nationally known Mining Co. in New York State**

Crushers: **Four No. 37½ Kennedy type "S" Roller Bearing Gyratory Crushers**

Feed Opening: **6¼"; Diameter of Head: 3 Feet**

Discharge Setting: **7/32" Closed Side at Head**

Capacity Each Crusher: **56 Tons Per Hour**

Horsepower Each Crusher: **48 HP.**

Closed Circuit Operation: **Gradation As Follows:**

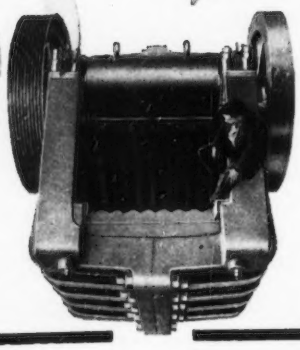
CHECK THE FIGURES!

99.8%	Minus	3	MESH
93.3	"	4	"
80.6	"	6	"
66.6	"	8	"
56.1	"	10	"
48.1	"	14	"
40.6	"	20	"

Can You Equal These Figures?

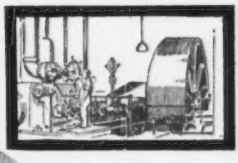
CHECK SWING JAW CONSTRUCTION

We checked POWER-LOSS in the "KVS" Swing Jaw Crusher. How? By making the STATIONARY jaw carry 50% of the crushing load, instead of leaving it all to the SWING jaw. Result—you SAVE POWER in crushing. Another thing we checked is PARTS TROUBLE, by making the swing jaw ALL IN ONE PIECE, except for the crushing plate. And we made that removable. Note also —Swing and Stationary jaws are INTERCHANGEABLE, and reversible end for end. This means DOUBLE jaw-crushing life. CHECK!



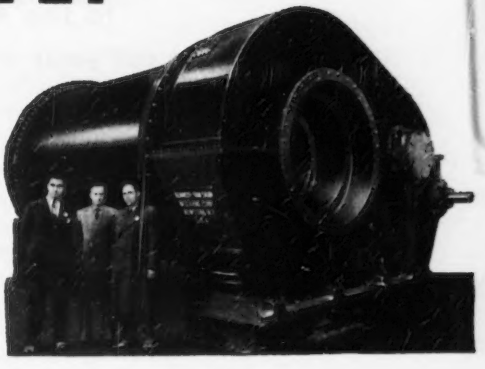
✓ CHECK YOUR KINETIC ENERGY

Ever check an old Corliss Engine and see how the big whirling flywheel or pulley developed KINETIC ENERGY (or, in simple words, added FREE power)? There's a BIG Pulley in the "KVS" Gearless, too! It revolves at a speed of 3,500 ft. per minute — that's what creates the EXTRA crushing power you get for nothing! What's more, the 11 ton pulley (used in a "KVS" Gearless Crusher weighing 400,000 lbs.) turns so easily you can turn it with TWO FINGERS! In short, more CRUSHING for LESS POWER COST (with much less vibration and much less NOISE), is the idea that put the "KVS" Gearless way out in front and keeps it there! And there are many other features . . . Check!



✓ CHECK THE FAT CHECK YOU WILL SAVE!

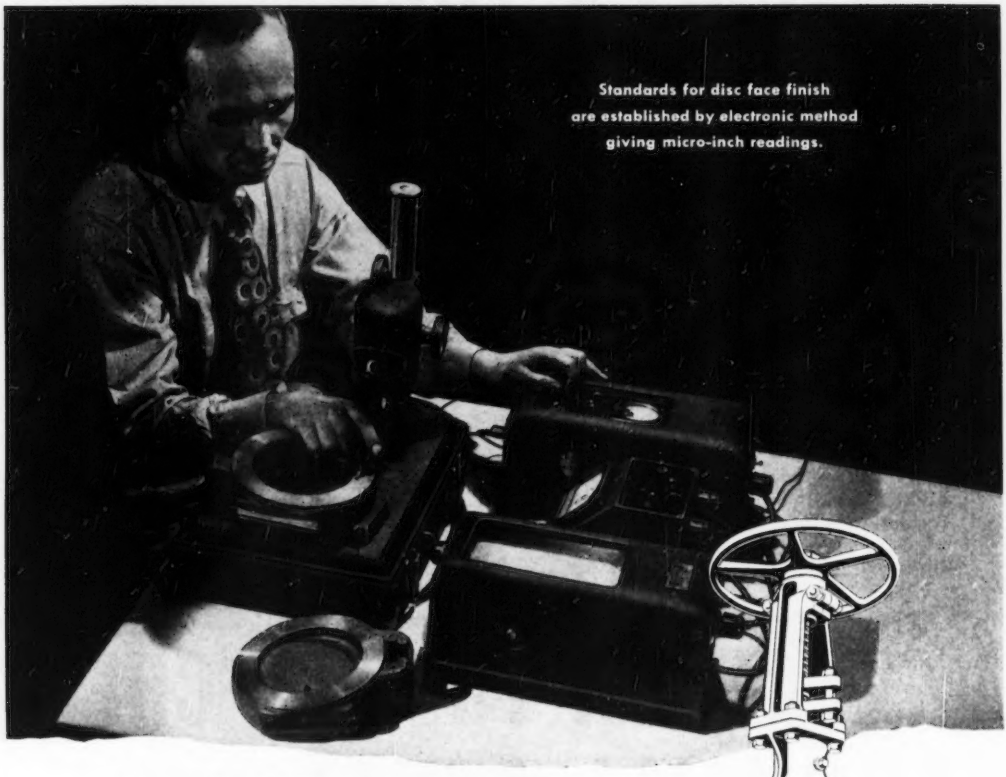
How'd you like to tear up your check for, say, $6,000 that you thought you'd have to spend on a 10 ft. tube or ball mill? Well — you can do just that if it is a "KVS" Mill with integral gear drive. With this drive, you can use a SYNCHRONOUS MOTOR, at a TREMENDOUS saving! Why? Because motor is DIRECT CONNECTED to driving shaft. Shaft is carried in roller bearings that CANNOT be misaligned or set wrong. The pinion shaft to which the motor is connected runs at approximately 600 r.p.m. while pinion shafts in other mills run at about 180 r.p.m. Another thing . . . "KVS" trunnions on large sized tube and ball mills are CARRIED ON OIL. Bearing never wears out, uses little power. All gears and bearings automatically sprayed with oil before tube mill is started (Design patented). In 15 years no "KVS" gears or pinions have worn out on this type mill. Check!



There are "KVS" BULLETINS covering all the above. Write for them today.

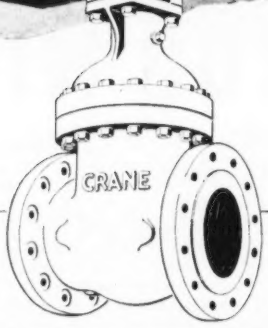
Kennedy-Van Saun
MANUFACTURING AND ENGINEERING CORPORATION
2 PARK AVE., NEW YORK 16, N. Y.
FACTORIES:
DANVILLE, PA., U. S. A.
CANADA, ENGLAND, FRANCE, AUSTRALIA

More **CRANE VALVES** are used than any other make



How CRANE controls quality to the Micro-Inch to cut your valve costs

Surface finish of a valve's working parts has a lot to do with its wear resistance and operating efficiency. A correct finish means a tighter-seating valve, easier operation, greater ease of maintenance. In Crane Quality valves, the surface finish of machined parts is measured and controlled to rigid limits. The standards for quality control of surface finish are determined by the most scientific methods as shown above. Yes, nothing is overlooked to make Crane Valves the lowest-cost valves in the long run. *That's Crane Quality!*



Precise quality control of materials, design, and manufacturing—to the highest degree in the industry—makes Crane valves the lowest cost valves in the long run. On steam service, oil and oil vapor lines, for example, you'll find Crane Steel Gate Valves a sure remedy for high maintenance costs. Talk it over with your Crane Representative.

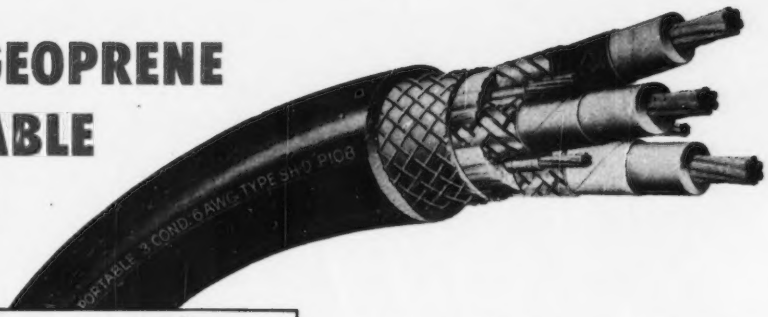
CRANE VALVES

CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Ill.
Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMBING • HEATING

HERE'S EXTRA STRENGTH... EXTRA TOUGHNESS

GEOPRENE PORTABLE CABLE



Compare—

and be convinced!

These figures, comparing ASTM requirements with typical G-E Geoprene values, indicate at once the superiority of portable cable with Geoprene sheath:

ORIGINAL	ASTM REQUIREMENTS	GEOPRENE TYPICAL VALUES
Tensile strength, lb/sq in.	1800	3000
Per cent elongation	300	500
Set in 2-in. test piece, in.	3/8	1/16
After 7 days in Geer oven at 70C		
Tensile strength, lb/sq in.	1600	2900
Per cent elongation	250	430
After 96 hrs. in oxygen bomb at 70C		
Tensile strength, lb/sq in.	1600	2800
Per cent elongation	250	430
After 18 hrs. in oil at 121 C		
Per cent depreciation in tensile strength	40	35
Per cent depreciation in elongation	40	35
Tear Test		
Tensile strength, min. lb/in.	40*	75

*This is the requirement for rubber jackets; no tear value has yet been set for neoprene-type jackets.

Look to G-E wire and cable for continuing progress toward
MORE TONS PER MACHINE PER DAY
Investigate these famous G-E cables for big returns in mining operations:
Mine power cable insulated with Super Coronol* . . . Versatol*-Geoprene portable cable . . . Bore hole cable . . . Varnished cambric cable . . . Locomotive cable . . . Flamenol* mine telephone cable . . . Shot firing cord . . . Deltabeston* power cable and magnet wire.
*Registered Trade Mark of General Electric Company

A portable cable whose jacket has much higher tensile strength than required by ASTM standards . . . more than twice the tear resistance of older-type jackets—that's General Electric Geoprene portable cable!

Give G-E Geoprene cable the hardest possible service—bury it under rock falls, maul it with heavy equipment, drag it behind mining machines, wind it off and on reels repeatedly—it's made to outlast cable made with natural rubber. And, at the same time, you'll get sizeable savings in replacement costs over types of cable that won't stand up under rough treatment.

Tough, cable-laid twine under the outer Geoprene sheath gives G-E portable cable additional strength. An inner jacket cushions conductors against hard knocks and operating abuses. And because high-voltage Geoprene portable cable is built to permit continued operation at 75 C, you can use sizes that are smaller, less bulky than otherwise possible.

Available in a wide range of sizes and with two, three, or four conductors, G-E Geoprene cable resists heat, sunlight, abrasion, oils, acids, alkalies, and flame. To find out about these and other advantages that this cable provides, write Section W18-995, Construction Materials Department, General Electric Company, Bridgeport 2, Conn.

GENERAL ELECTRIC

THE GREAT NEW Mid-Century U.S. ROYAL FLEETMASTER

Spear Head Penetration Off the Road-

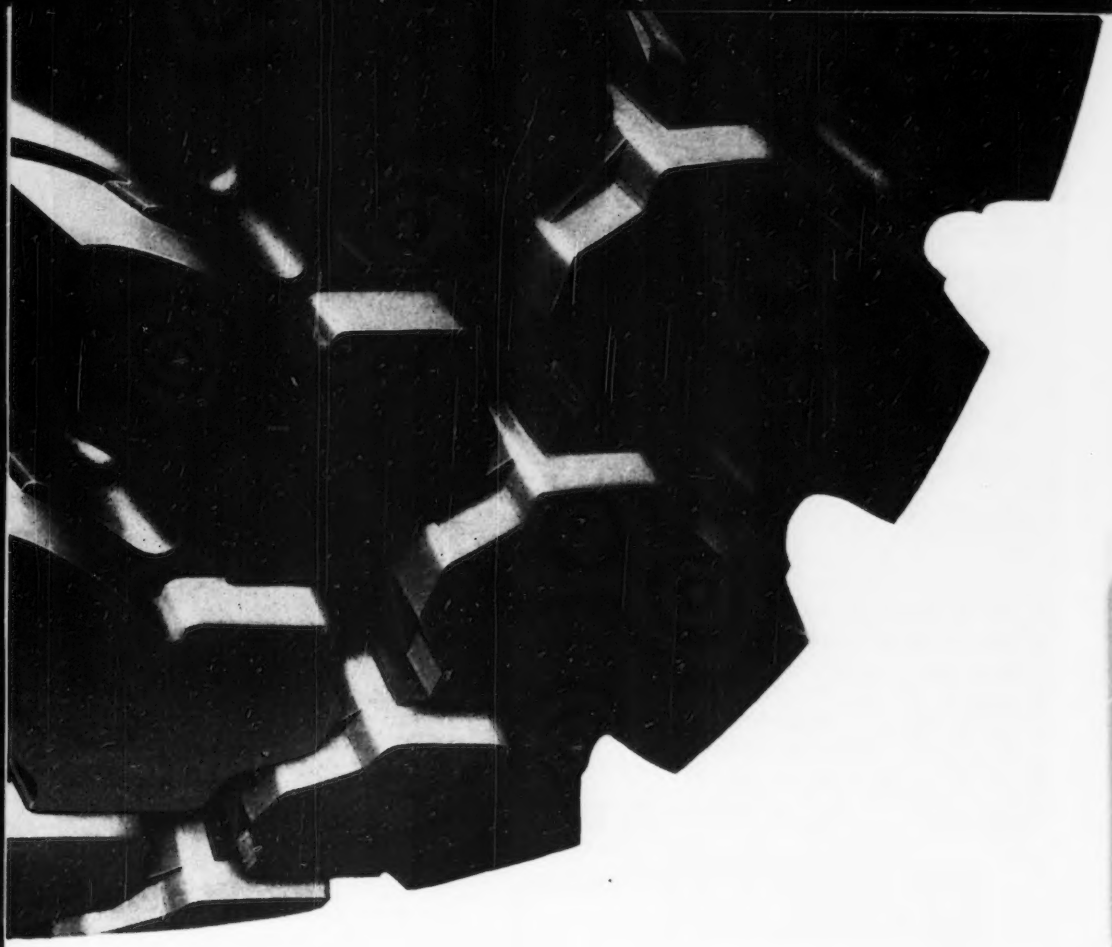
Never Before! A genuine "on-and-off-the-road tire" for the Truckers of America!

Never Before! Job-fitted tread and side-wall compounds to meet the demands of every free-rolling, deep-traction truck service.

Never Before! Such traction and rolling for these varieties of truck service—to radically cut ton-mile transportation costs.

Mid-Century Truck Tires

UNITED STATES



-with smooth Non-Skid Highway Rolling

"MADE-TO-ORDER" for the Mining Industry!

- **Over jagged roadbeds . . .** to non-skid highway speeds!
- **From snow-swept roads . . .** to hot and dusty highways!
- **Through rocky cuts . . .** up steep slopes to asphalt and concrete!

TODAY'S SUPREME TRUCK TIRE WITH HIGHWAY AND OFF-THE-ROAD TRACTION ***never possible before!***

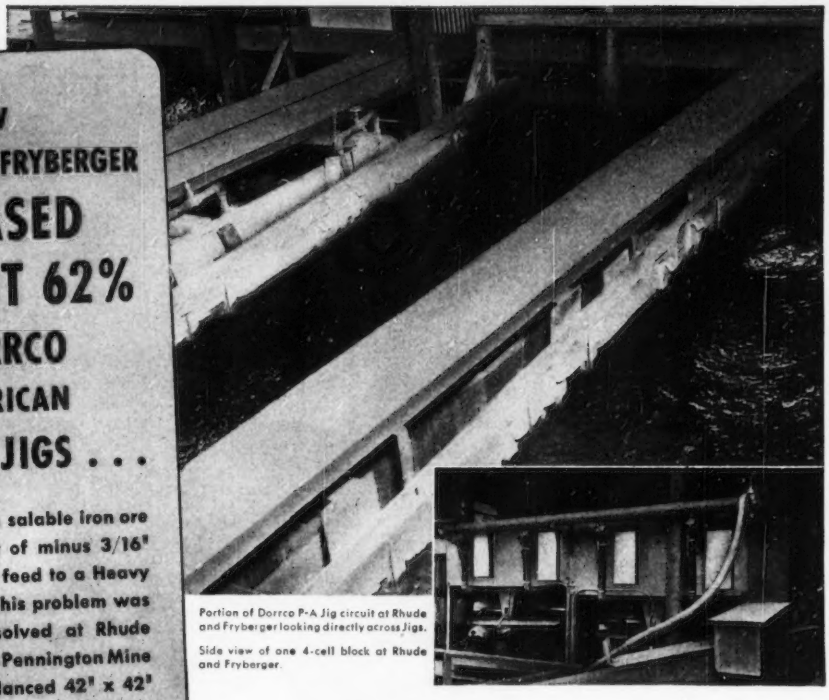
★ *Job-fitted tread and sidewall compounds*
★ *Free-rolling tread surface*
★ *SPEARHEAD depth traction*
★ **NON-SKID** ★ **CHIP-RESISTANT**

A PHONE CALL DOES IT! This is another U. S. Rubber achievement—without rival, imitator or comparison. Phone your nearest U. S. Royal Dealer for Complete Performance Proof and your own JOB-FITTED SPECIFICATIONS.

RUBBER COMPANY ***America's Largest Makers of Tires***

here's how RHUDE and FRYBERGER INCREASED OUTPUT 62% with DORRCO PAN-AMERICAN PLACER JIGS . . .

How to make a salable iron ore concentrate out of minus 3/16" undersize from feed to a Heavy Media Plant? This problem was economically solved at Rhude and Fryberger's Pennington Mine by sixteen balanced 42" x 42" Dorrco Pan-American Placer Jigs.



Portion of Dorrco P-A Jig circuit at Rhude and Fryberger looking directly across Jigs.

Side view of one 4-cell block at Rhude and Fryberger.

HERE'S THE FLOWSHEET:

Feed from the crusher is screened and the plus 3/16" material conveyed to the HMS Plant. The minus 3/16" undersize which is too fine for dense media treatment is first deslimed and dewatered to a 2:1 water/solid ratio, and then split evenly to four end-flow blocks of Dorrco P-A Placer Jigs, each block containing four cells in series. Approximately 30% of the total feed is jigged; 45% goes to the HMS Plant and the remaining 25% is discarded as slime.

HERE ARE THE RESULTS . . . Approximately 55% of the 800 TPD Jig feed is recovered as a concentrate averaging 53—54% Fe and 12—13% silica. The total plant output has been increased 62% over that obtained by Heavy Media Separation alone.

Equally important, Supt. P. H. Ramsden states that the operating results of the Jig Plant on fine ore are slightly superior to those obtained on the course fraction being treated by HMS.

These results graphically illustrate the complementary functions of Dorrco P-A Placer Jigs and HMS Plant for iron ore concentration.

Bulletin #2401, just off the press, contains 16 pages of detailed information on this modern unit. A copy is yours for the asking.

DORRCO

THE DORR COMPANY, ENGINEERS
BARRY PLACE, STAMFORD, CONN.
NEW YORK • ATLANTA • TORONTO
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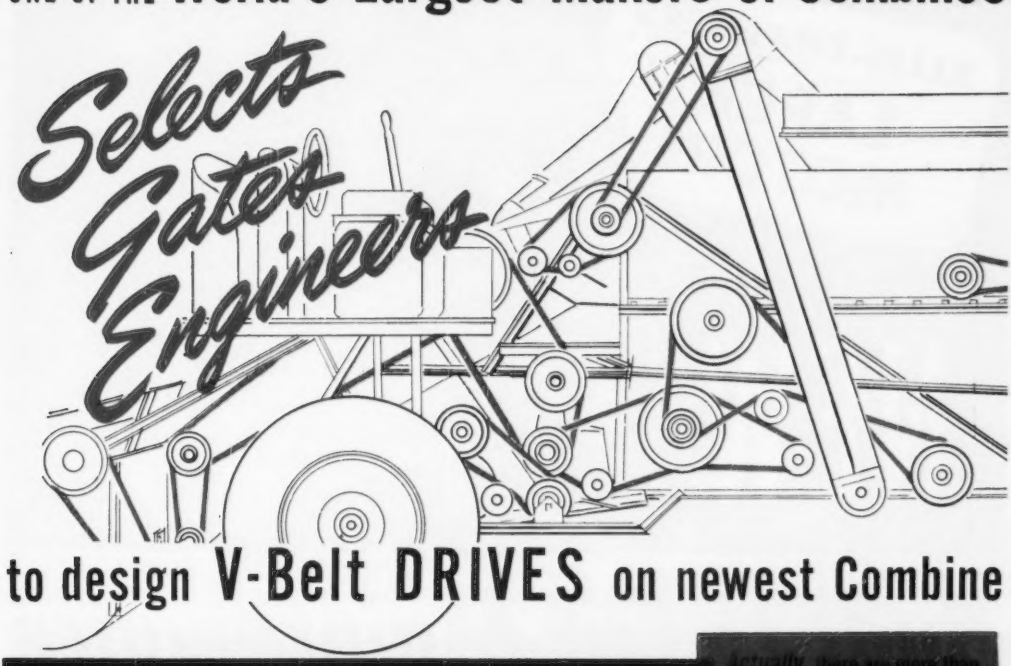
DORR

RESEARCH — ENGINEERING — EQUIPMENT

ONE OF THE World's Largest Makers of Combines



to design V-Belt DRIVES on newest Combine

A Completely V-Belt Driven Combine . . . Every drive of the most advanced design

In order to reduce the wear and tear of operating his combine, the manufacturer wanted every moving part that was subject to shock to be "cushioned" by the **shock-absorbing** properties of a V-belt Drive—and he wanted to be sure that every V-belt Drive embodied the most advanced engineering design.

He knew that the Gates V-Belt testing laboratories are by far the largest in the world—that Gates runs an average of 32,000 hours of testing every **week** on V-Belts alone! (32,000 hours is equivalent to five years of life for one belt.)

And he knew that Gates hadn't stopped with testing—that Gates Research Engineers had actually reduced the **results** of these tests to **usable data** for the design of every V-belt Drive.

This intensively SPECIALIZED Research has naturally given Gates Engineers a most advanced knowledge of V-Belts and V-Belt Drive Design—and the benefit of this advanced knowledge and experience is available to **you, right in your own plant, any time you want it!**

Whether you have a difficult drive to design—whether some V-Belt drive in your plant is giving trouble—or whether you merely want to know what size and construction of V-Belts will give the most efficient and the lowest cost service on a particular drive—you have only to phone a Gates Engineer.

Actually, there are more than a dozen GATES V-BELT DRIVES on this One Combine!

Some of them you can't see, no matter what view of the Combine is given. Every one of these drives had to be of the most advanced engineering design to insure superior service.

Gates Eng-509

The Mark of SPECIALIZED Research

There is always a Gates Field Engineer near you in all industrial centers. Just look in your phone book under "Gates Rubber." He will come to you promptly—and he will put at your service the full benefits of Gates unrivaled V-belt knowledge and experience **without the slightest obligation!**

THE GATES RUBBER COMPANY
The World's Largest Makers of V-Belts
DENVER, U.S.A.

GATES VULCO ROPE DRIVES
Engineering Offices and Jobber Stocks IN ALL INDUSTRIAL CENTERS of the U.S. and 71 Foreign Countries

Built to Cut Maintenance

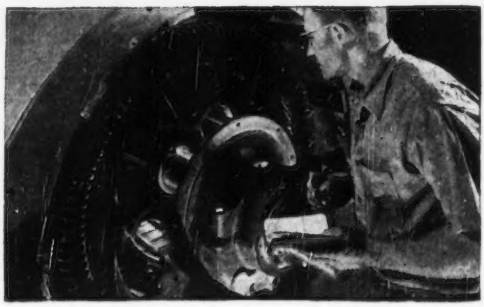
EASIER MAINTENANCE PROCEDURES and lower maintenance costs are important features of this brand new line of large motors. One man can perform all routine maintenance procedures, including opening up the motor for cleaning. Bearing surfaces are not exposed to abrasive grit and dirt during cleaning operations.

The appearance of this new line of large motors reflects the advanced design and fine workmanship that goes into their manufacture.

A well-braced, sturdy fabricated steel frame with cast-iron end brackets rigidly support and protect working parts. Ventilating openings are large to provide adequate cooling air at low velocities with resultant low sound level.

Wide Range of Sizes

These new design Allis-Chalmers drip-proof and splash-proof squirrel-cage induction motors are built in sizes from 60 hp at 300 rpm to 1500 hp at 1800 rpm. Ask your Allis-Chalmers representative to show you the details of this exceptional new motor or write for Bulletin 05B6112.



How's This for Accessibility

One man can remove the end brackets and air baffles and reach right inside motor with his vacuum cleaner or air hose. Bearing remains sealed against abrasive dirt throughout the cleaning operation.

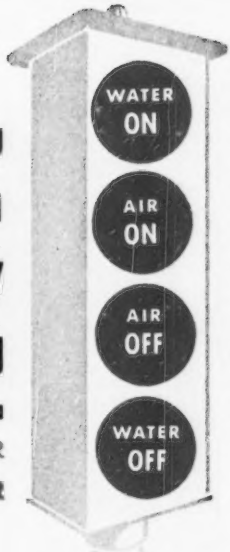
Large air discharge openings with removable louvers allow plenty of room to get in with an electric drill for doweling and bolting the motor to the base. Plenty of room to reach up back of the stator core for cleaning.

A-3179

ALLIS-CHALMERS, 969A SO. 70 ST
MILWAUKEE, WIS.

ALLIS-CHALMERS

you can stop dry drilling with a GARDNER-DENVER RB STOPER



An exclusive Gardner-Denver feature can help you eliminate dry drilling. It's the new *air-operated* water control valve — available only on Gardner-Denver RB Stopers.

This unique valve assures a flow of water to the face of work both before and during the drilling operation. *One* throttle valve, operated by a conventional throttle valve handle, controls all functions of drilling and water control. The desirable "water on—air on—air off—water off" cycle required in some localities is provided automatically.

and here's another RB advantage you'll like

The throttle valve is fitted with a tubular screen which is automatically cleaned by live air each time the handle is brought past the "off" position. Any accumulated dirt is blown out of the drill, and time out for cleaning a clogged screen is practically eliminated.

Gardner-Denver RB104 —the heavy-duty self-rotating stoper with exceptionally high drilling speeds.

Gardner-Denver RB94 —the fast drilling, self-rotating stoper that weighs only 100 pounds.

Bulletin SD2 gives complete information on Gardner-Denver Stopers —write today for your copy.

Gardner-Denver Stopers are famous for their safe handling, fast drilling, smooth feeding and their constant sludge protection.

GARDNER-DENVER

Since 1859

Gardner-Denver Company, Quincy, Illinois
In Canada:
Gardner-Denver Company (Canada), Ltd., Toronto, Ontario

the fast,

low-cost way

to get

worn teeth

back in service!

1. Worn tooth . . . 2. Plus AMSCO Tooth Repointer . . . 3. Equals like-new tooth—ready for service!

AMSCO® tooth repointers

AMSCO Repointer Bars

3 teeth partially rebuilt with AMSCO Repointer Bars to show sectional view of welding method. These Repointer, or Wedge Bars, are also made in many shapes and sizes. Apply AMSCO Economy Hardface to the rebuilt tooth *—for as much as 3 times longer service!*

● Here's a typical example of a badly worn dipper tooth completely restored to service . . . simply by welding on the AMSCO Cast-To-Size Tooth Repointer. The result is like-new service life and efficiency, plus a long-wearing tooth of Manganese Steel—the steel that actually work-hardens in service. Cost? *Far less than replacement!*

Wherever equipment has teeth that wear, more and more owners are using money-saving AMSCO Tooth Repointers . . . available in a wide variety of styles and sizes.

Get all the facts! Write today for Bulletin W-10-A —showing complete instructions for use.

put LIFE into service with

AMSCO®
WELDING PRODUCTS

AMERICAN Brake Shoe COMPANY

AMERICAN MANGANESE STEEL DIVISION
376 EAST 14th STREET • CHICAGO HEIGHTS, ILL.

Other Plants: New Castle, Del., Denver, Oakland, Cal., Los Angeles, St. Louis. In Canada: Joliette Steel Division, Joliette, Que.

Built in Light, Medium and Heavyweight sizes . . . the latter models drill to as much as 45' depths, using steel changes up to 15'—the Medium has "Hydra-Lift" hydraulic control.

FASTER, LOWER-COST DRILLING!

JOY *Lightweight* WAGON DRILLS

THE EXCLUSIVE "DRILL AND BLOW" FEATURE MEANS YOU BLOW THE HOLE AS YOU DRILL!

- ☆ LIGHTWEIGHT only 750 lbs.
- ☆ EASY ONE MAN HANDLING
- ☆ FINGER-TIP CONTROL
- ☆ POSITIVE LOCKING BRAKES

WRITE FOR BULLETIN, OR *Consult a Joy Engineer*

W&D C 2817

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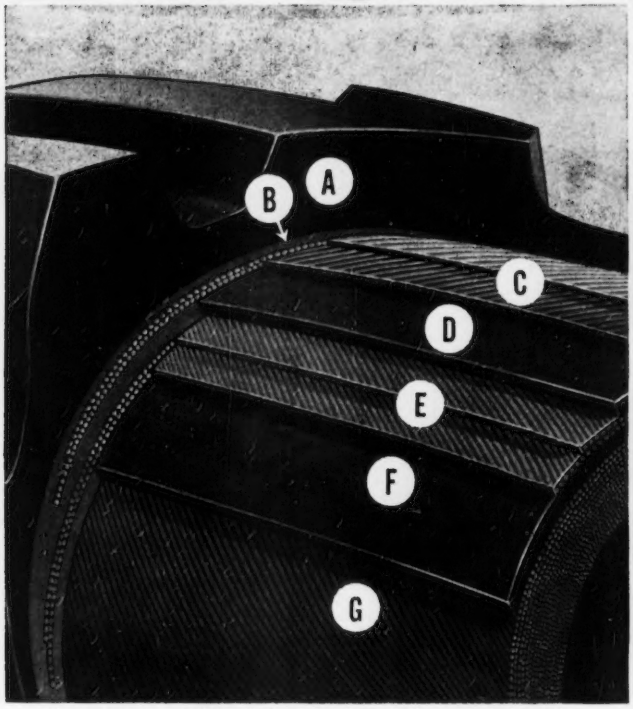
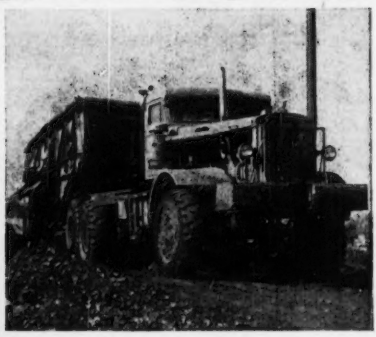
GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.

IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, GALT, ONTARIO

B.F.Goodrich



Cross-section view of Universal Silvertown shows *double nylon shock shield.* (A) Extra-thick, cut-resisting tread rubber. (B) Cushion strip. (C) Top layers of nylon shock shield. (D) Heavy cushion strip. (E) Lower layers of nylon shock shield. (F) Heavy cushion strip. (G) All-rayon cord body.



Universals at work in open pit mine. Note husky, wedge-shaped cleats. Tire is non-directional, may be mounted either way on any wheel . . . cuts tire inventory!

WANTED: Maximum traction — Here, BFG mine tires move 65-ton loads through soggy going. Specially designed tread also helps prevent sideslip.

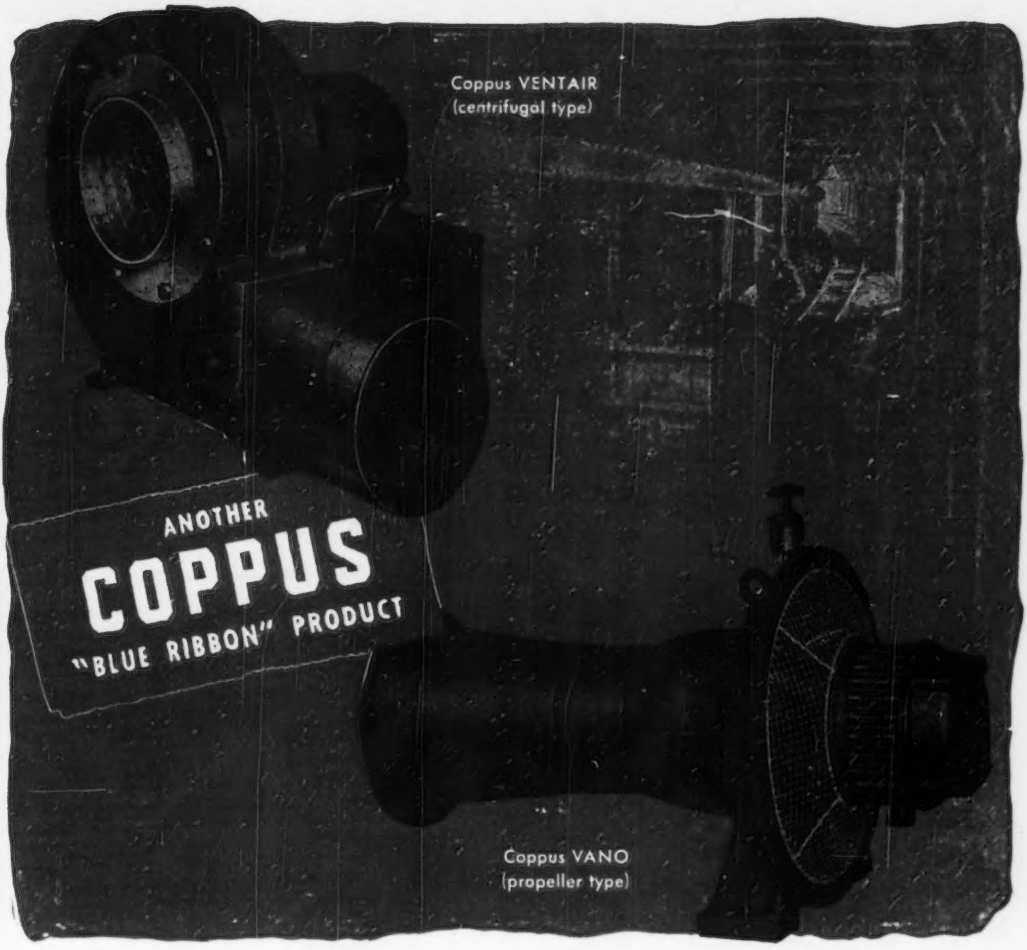
Nylon shock shield—the reason only BFG can give you more tire per dollar!

MINING jobs are *tough on tires.* But the tougher the job, the higher the praise for B. F. Goodrich mine tires. BFG tires chalk up performance records because of special, *exclusive* construction features.

The nylon shock shield, for example —strong, elastic nylon (see illustration above) absorbs and distributes impact, protects the rayon cord body. Nylon shock shields are built into all BFG coal mine tires and double nylon shock shields in all tires, size 12.00 and larger. And *only* B. F. Goodrich gives you this added protection, the added savings of (1) longer tire life (2) more recappable tires (3) greater bruise resistance (4) less chance of tread separation.

Also, BFG puts nylon to work for mine operators in additional ways. In large size tires which may require even greater protection on extremely tough jobs . . . *All-Nylon* construction is used. To the operator, the All-Nylon tire is a case of "paying a little more for a lot more" for consider this: *in all tests not a single All-Nylon tire blew out, not one flex break occurred!*

For complete details on BFG mine tires call your local dealer or write direct: *The B. F. Goodrich Company, Akron, Ohio.*



Two Blowers . . . One Purpose:
30 to 100% More Air

Why two totally different blower types? Because the requirements of mine ventilation fall into two entirely different categories.

For high pressures, long pipe lines, use the Coppus VENT-AIR (centrifugal type). For medium pressures, shorter pipe lines, the Coppus VANO (propeller type) is best. One or the other will give you more air per given power consumption than other blowers — from 30% to 100% more. Can be used as blowers or exhausters, capacities up to 90,000 CFM, with compressed air or electric motor drive.

Only Coppus makes both types. And, for quick recognition, each wears the famous "Blue Ribbon," distinguishing mark of top-quality engineering, materials and performance. This blue band is your guarantee of better mine ventilation . . . Look for it.

Representatives listed in MINING CATALOGS. Other Coppus "Blue Ribbon" products: steam turbines, gas burners, heat killers, air filters, blowers and exhausters for special purposes. See also THOMAS' REGISTER . . . Coppus Engineering Corporation, 282 Park Ave., Worcester 2, Mass.

COPPUS ENGINEERING CORPORATION
290 Park Avenue, Worcester 2, Mass.

Please send: Bulletin 130.

Name. . . . . .

Company . . . . . .

Address. . . . . .

Check YOUR output against

HAUL one way	TRIPS per hour (per unit)	PAY YARDS per hour (per unit)	Name of Owner	Job Description	Type of Material	Job Conditions
50'-300'	31	310	Moss Construction Co. *Paris, Ill.*	2 C Tournapulls leveling 160,000 yds. for Logan County Airport at Lincoln, Ill.	Common earth and clay.	No established haul roads due to scattered grading. Occasional heavy rains.
150'	Not measured	125 self-loaded	Griggs County Soil Conservation District, *Cooperstown, N. D.*	1 D Roadster digs 250 yd. drainage ditch near Anete, N. D.	Sandy loam.	Normal.
175'	35	90 self-loaded	Griggs County Soil Conservation District, *Cooperstown, N. D.*	1 D Roadster digs drainage ditch on farm near Cooperstown, N. D.	Black loam.	Typical drainage ditching.
200'	42	450	Elmer Anderson, Contractor *Lyle, Minn.*	2 C Tournapulls on 169,000 yd. Stevens County road job south of Alberta, Minn.	Loam and clay.	Average.
200'	30	150 self-loaded	Roy Jones, Contractor *Ipswich, S. D.*	1 D Roadster building series of 1500 yd. soil conservation dams in Edmunds County. Schedule includes one dam per day.	Sandy clay and gravel.	Material sun-baked, extremely dry.
200'	25	137.5 self-loaded	Roy Kohl, Contractor *Springfield, Ohio*	1 D Roadster grading 45,000 yds. for industrial plant site at Yellow Springs, Ohio.	Mostly loam, clay; with occasional gravel.	Good weather, level grades.
325'	15	176.5	Escritorio Tecnico C. F. Pereta e Navi, *Sao Paulo, Brazil*	3 C Tournapulls grade 1,045,000 yds. for new Sao Paulo governmant housing project in Casingui, Brazil.	Heavy, wet clay.	Continuous tropical rains soak material, cut working time to 8 days a week.
300'-400'	22.9	125 self-loaded	C. H. Wilhelm, Contractor *Faulkton, S. D.*	1 D Roadster on soil conservation dam near Faulkton, S. D.	Dry, sandy clay.	Hard material. 15-19% grades on return haul.
300'-500'	20	120 self-loaded	William Cloader, Contractor *Clawson, Mich.*	1 D Roadster levels 25,000 yd. subgrade for 550-home Royal Oak subdivision near Detroit, Mich.	Topsoil and clay.	Tight quarters . . . hauling and spreading among houses and foundations.
425'	20	80 self-loaded	Demonstration for Cleburne County Highway Dept., *Heflin, Ala.*	1 D Roadster on county road improvement near Heflin, Ala.	Hard, rocky clay.	Tough material required roating, loaded with high voids.
500'	24	Not measured	Orleans Construction Co. *Philadelphia, Pa.*	2 D Roadsters on 450,000 yd. leveling for Lynnewood Gardens Housing project, Philadelphia, Pa.	Sand, topsoil.	Up 20% approach grade to top of stockpile.
500'	17	170	John P. Walser, Contractor *Pontiac, Mich.*	2 C Tournapulls build settling area for sewage disposal system at Camp Grayling, Mich.	White Michigan sand.	Very loose, very abrasive material.
500'	14.25	150	Anderson Bros. *Rockford, Ill.*	1 C Tournapull on 100,000 yd. levee to protect canning plant site at Mendota, Ill.	Sticky clay and topsoil.	Haul road often 12" deep in water.
550'	16	176	Vernie Jarl, Contractor *Gresham, Ore.*	3 C Tournapulls on 5¼ mile, 410,000 yd. relocation of Rt. 101 near Tillamook, Ore.	Sand, gravel, hardpan, clay, and loamy topsoil.	Material saturated by continual heavy rainfall.
600'	20	200	R. V. McElroy Construction Co. *Decatur, Ill.*	1 C Tournapull on 663,000 yd. bridge approaches and relocation of U. S. 40 near Greenup, Ill.	Hard-packed clay.	Return 200' up 21% grade to cut.
600'	20	200	Isbell Construction Co. *Reno, Nev.*	2 C Tournapulls on 17.6 mi., 316,000 yd. road construction near Elko, Nev.	Mixed sandstone, clay, loam.	15% return grade. 6500' altitudes.
600'	13	117	Central Waterways Irrigation & Navigation Com. *New Delhi, India*	2 C Tournapulls on 25,000,000 yd. Hirakud Dam across Mahanadi River in India.	Hard, rocky clay.	100' of 20% grade. Very rough haul road.
600'	11	135	Haley, Chisholm and Morris Construction Co. *Charlottesville, Va.*	1 C Tournapull on 1,200,000 yd. expansion of railroad yard at Russell, Ky.	Loose, dead sand.	Tough-loading material. Unstable haul road.
650'	23.5	235	Moss Construction Co. *Paris, Ill.*	2 C Tournapulls leveling 160,000 yds. for Logan County Airport, Lincoln, Ill.	Common earth and clay.	No established haul rbads. Very heavy rains.
660'	17.6	Not measured self-loaded	Sagdeo & Sivier, Inc. *Hazel Park, Mich.*	4 D Roadsters move 450,000 yds. for new race track near Detroit, Mich.	Topsoil.	Precision spreading.
700'	15	75 self-loaded	Sorenson Bros. *Murray, Utah*	1 D Roadster land-levels 15,000 yds. at Jeremy Ranch, Salt Lake City, Utah.	All clay.	Rough haul roads.
700'	13	117	Schultz and Lindsay *Fargo, N. D.*	2 C Tournapulls on 380,000 yd. Riverdale, N. D., housing project for Garrison Dam workers.	Sandy clay and loam.	Normal.
700'	15	150	B. G. Young & Sons *Johnson City, Tenn.*	2 C Tournapulls grade 130,000 yds. for airport at Greeneville.	Common earth.	Haul up 6% grade.
650'-750'	10	100	Peterman Bros. *Tasso, Miss.*	2 C Tournapulls strip 65,000 yds. of overburden from gravel pit at Crenshaw, Miss.	Sticky, wet clay, loam.	"Shut-down" weather conditions. 250' haul up 12% grade, 310' over hub — deep, soft fill.
800'	18	180	Isbell Construction Co. *Reno, Nev.*	2 C Tournapulls on 17.65 mi., 316,000 yd. road construction north of Elko, Nev.	Sand, loam.	7% adverse grade on return. 6500' altitude.
800'	14	84	Hoppe Construction Co., Inc. *Burbank, Calif.*	2 D Roadsters grade 90,000 yds. for new housing project at Van Nuys, Calif.	Sandy loam.	Average.
850'	7	Not measured	Henry Thygeson, Contractor *Albuquerque, N. M.*	1 C Tournapull on highway construction near Belen, N. M.	Loose, powdery blow-sand.	Cuts sprinkled to speed loading. Loose footing all the way.
800'-1000'	7	77	Vernie Jarl, Contractor *Gresham, Ore.*	3 C Tournapulls on 5¼ mile, 410,000 yd. relocation of Rt 101 south of Tillamook, Ore.	Sand, gravel, hardpan, clay and topsoil.	Material saturated by heaviest rainfall in U. S.
950'	16.5	90 self-loaded	Roy Kohl, Contractor *Springfield, Ohio*	1 D Roadster grading 45,000 yds. for new industrial plant in Yellow Springs, Ohio.	Loam, clay; gravel in spots.	Haul grades up to 10%.
1000'	11.5	115	Green Construction Co. *Oakland, Ind.*	2 new C Tournapulls, 5 Super C Tournapulls finish 500,000 yd. airport at Owensboro, Ky., 165 days ahead of schedule.	Heavy, water-logged clay.	October rains made job unworkable for all units except new Tournapulls.
1000'	16	144	"Dirtmovers" *Minneapolis, Minn.*	2 C Tournapulls grade 45,000 yd. addition to Wold Chamberlain Airport, Minneapolis.	High-void sod, topsoil.	Normal . . . material dry.
1100'	8	104	Cia. Azucarera Vertientes, *Cespedes, Cuba*	4 C Tournapulls on 170,000 yd. earthfill dam in Central Estrella, Cuba.	Hardpan, clay, and sand.	Haul up 3 to 25% grades

LE TOURNEAU PEORIA, ILLINOIS — JOB-PROVED Over 6,350 Built and Shipped — **TOURNAPULLS**

PROVED BY 13 YEARS OF RUBBER-TIRED TOURNAPULL PERFORMANCE

these TOURNAPULL JOBS

HAUL one way	TRIPS per hour (per unit)	PAY YARDS per hour (per unit)	Name of Owner	Job Description	Type of Material	Job Conditions
1100'	13.3	70 self-loaded	Lawrence County Highway Dept. *Moulton, Ala.*	1 D Roadster on 11 miles of new farm-to-market road near Moulton, Ala.	Typical Alabama red clay.	Average conditions.
1100'	17	104	Lawrence County Highway Dept. *Moulton, Ala.*	1 D Roadster pusher-loaded on same Moulton road job.	Alabama red clay.	Average conditions.
1200'	15	150	Curabee Construction Co. *Toccoa, Ga.*	3 C Tournapulls build 376,000 yd. fill across shallow lake for Central Florida through highway near Haines City.	Loose, hard-loading sand.	Haul 600' over sand, 600' over new road bed.
1200'	10	50 self-loaded	Rhoton & Frysinger Construction Co. *Columbus, Ohio*	1 D Roadster used as finishing tool on 10-mile, 178,000 yd. subgrade for U. S. 30 in Crawford and Wyandot Counties, Ohio.	Topsoil, clay and silt.	Load around poles, culverts. Share haul road with rock trucks, other traffic.
1250'	14	84	Hutchinson & Wyatt *Sandyville, W. Va.*	2 D Roadsters extend taxiways at Kanawha County Airport, Charleston, W. Va.	Rock-hard, sun-baked clay.	Extremely dry, tough material.
1250'	12	125	Haley, Chisholm & Morris Construction Co. *Charlottesville, Va.*	1 C Tournapull on 1,200,000 yd. railroad yard expansion at Russell, Ky.	Loose, abrasive sand.	Rough, pitted haul.
1250'	9	103.5	Anderson & Davenport *Springfield, Ill.*	2 C Tournapulls on 155,000 yd. grading for Murdale Airport near Carbondale.	Sandy loam.	Ideal weather, material; but rough haul roads.
1400'	10	105	Haley, Chisholm & Morris Construction Co. *Charlottesville, Va.*	1 C Tournapull on 1,200,000 yd. expansion of railyard at Russell, Ky.	Sand.	Pitted, uneven haul road.
1500'	20	200	Peterman Bros. *Yazoo, Miss.*	2 C Tournapulls strip 65,000 yds. of overburden from gravel pit at Crenshaw, Miss.	Common earth, clay.	Up 12% grade for 250' . . . otherwise excellent haul roads permitting travel in 4th gear.
1600'	9.5	114	A. F. Schams, Contractor *LaCrosse, Wis.*	1 C Tournapull on 120,000 yd. overpass fill for U. S. 12 and 18 near Mauston, Wis.	Swamp sand.	Material loaded under water, hauled up 4 to 8% grades. Poor footing.
1600'	17.5	105	Sugden & Sivier, Inc. *Hazel Park, Mich.*	4 D Roadsters grade, build 450,000 yd. race track near Detroit, Mich.	Fill 9" sand, 8" clay, 3½" topsoil and clay.	Precision spreading, banking on track. Travel through traffic on paved roads.
1700'	10	50 self-loaded	Sam Glasgow, Contractor *Glenside, Pa.*	1 D Roadster, leveling industrial plant site in Philadelphia, Pa.	Sandy clay.	Average conditions.
2000'	9	108	Hollo L. Toor Co. *Durham, N. C.*	4 C Tournapulls build 450,000 yd., 1100' embankment across tidal inlet swamp on U. S. 50 between Washington and Annapolis, Md.	Ocean silt and sand.	Steep cuts. Material dumped to displace soft swamp muck.
2350'	8	36 self-loaded	Demonstration for Cleburne County Highway Dept., *Hollis, Ala.*	1 D Roadster on cut and fill work for secondary road near Tuscumbia, Ala.	Common earth.	Normal.
2400'	8.2	78	Moon Bros., Inc. *Moorhead, Minn.*	2 C Tournapulls rebuilding 370,000 yd., 13.3 miles of Hwy. 81 north of Shelly, Minn.	Tough, sticky gumbo.	Haul over rough, soggy roads.
2625'	14.3	163.5	Rogelio Viesca, Contractor *Mexico City, Mexico*	2 C Tournapulls widen embankment for spur rail line to Pemex Refinery, Atzcapotzalco, Mexico.	Compacted topsoil.	Hard, dry material.
2640'	10	60	W. B. Bennett Paving, Ltd. *Oshawa, Ontario*	2 D Roadsters handle 9,000 yd. subgrade for city street in Oshawa, Ont.	Sandy clay mixed with small stones and old road-surfacing material.	Load around man holes, gas lines in street. Haul ½ mi. through traffic and across busy intersections.
3000'	7	70	R. V. McElroy Construction Co. *Decatur, Ill.*	1 C Tournapull on 663,000 yd. relocation of U. S. Hwy. 40 near Greenup, Ill.	Hard-packed clay.	Return 400' up 17 to 21% grades. Spongy fill.
3200'	7	42	Chippewa County Highway Dept. *Chippewa Falls, Wis.*	3 D Roadsters on 100,000 yd. relocation of Highway M in Chippewa County, Wis.	Glacial sand.	Abrasive materials. Level haul.
3100'-3350'	6.4	32 self-loaded	Griggs County Soil Conservation District *Cooperstown, N. D.*	1 D Roadster repairs township road in Griggs County, N. D.	Hard, dry clay.	Hilly.
3750'	10	100	Wylie Brothers *Albuquerque, N. M.*	2 C Tournapulls handle 89% of 163,000 yd. highway job east of Hobbs, N. M.	Sandy clay.	Haul 500' across field, make sharp turn on to highway, travel 3250' in traffic.
3500'-4000'	7.5	82.5	Hollo L. Toor Co. *Durham, N. C.*	4 C Tournapulls build 450,000 yd. 1100' embankment across tidal swamp for relocation of U. S. 50 between Washington and Annapolis, Md.	Ocean silt and sand.	Steep cuts. Material spread on soft swamp fill to displace muck.
4000'	8	80	R. V. McElroy Construction Co. *Decatur, Ill.*	1 C Tournapull on 663,000 yd. relocation of U. S. Hwy. 40 near Greenup, Ill.	Clay.	Return 400' up 17 to 21% grades. Spongy fill.
4000'	5	35	Noel Brothers *Greeneville, Tenn.*	1 D Roadster filling in between foundation walls and columns of tobacco warehouse at Greeneville, Tenn.	Extremely hard, dry clay.	Load, dump in narrow lanes between warehouse walls, columns.
4400'	5	22.5 self-loaded	Dane County Highway Dept. *Madison, Wis.*	3 D Roadsters improve city streets in Verona, Wis.	Sand, gravel.	Haul through traffic. Spread in soft mud holes.
4500'	5.5	60.5	G. F. Taft, Contractor *Northville, Mich.*	2 C Tournapulls handle final grading on 1,000,000 yd. expansion of Wayne Major Airport near Detroit, Mich.	Sand, clay, and topsoil.	Thin cuts, shallow fills, good weather.
5940'	5	Not measured	John F. Wolser, Contractor *Pontiac, Mich.*	2 C Tournapulls grade, gravel 3 mi. of access roads in Camp Grayling, Mich.	Gravel, sandy loam.	Loose, abrasive material.
7920'	4	48	A. L. Dyer & Sons *McBrides, Mich.*	3 C Tournapulls on 5 mi., 210,000 yd. Hwy. 57 job west of Carson City, Mich.	Topsoil, clay and fine dune sand.	Part of haul over existing highway through heavy traffic

Note { C TOURNAPULL — 13.5 yds., speeds to 35 m.p.h.
D ROADSTER — 7 yds., speeds to 28 m.p.h.

Short hauls or long—

all types of scraper materials, under all job conditions, big jobs, little jobs, anywhere dirt is moved . . . Tournapull speed, versatility, and low cost of operation add up to lowest net-cost-per-yard. Check YOUR job records against those listed above . . . then see your LeTourneau Distributor for complete information on what these electric control, rubber-tired Tournapulls can do for YOU.

Tournapull Trademark Reg. U. S. Pat. Off. C131

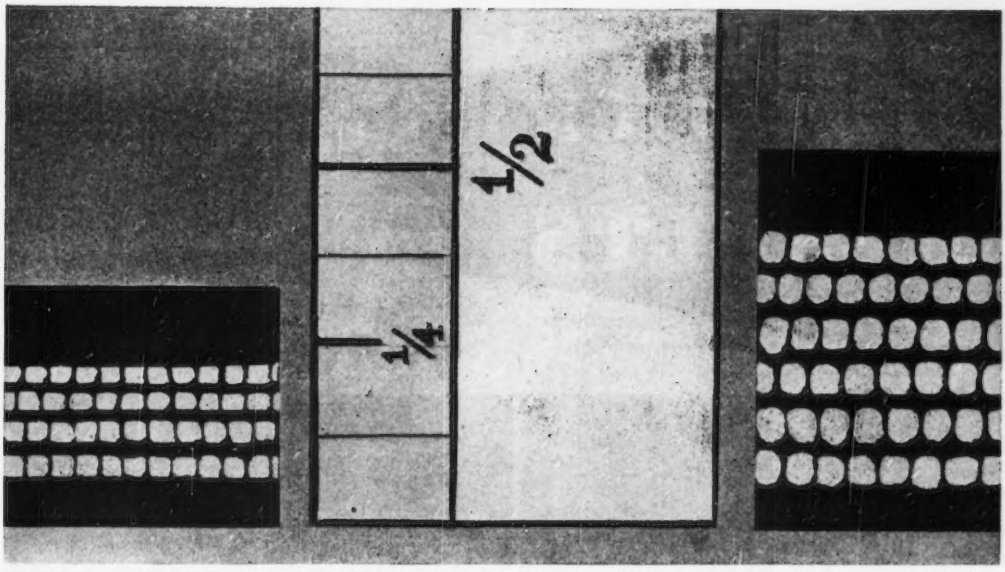
Here's A Tip for Your Pit..

Boost Output with Bucyrus-Eries!

MINE owners all over the world agree that there's no better excavator for your ore-loading assignments than a Bucyrus-Erie. That's because Bucyrus-Eries combine power, speed and economy with a sturdy, simple design that means faithful service throughout years of profitable operation. Easy to operate, easy to maintain, Bucyrus-Erie excavators are built in a range of sizes to suit the requirements of any open-pit operation. Your Bucyrus-Erie distributor can give you full information on these outstanding ¾- to 4-yard gasoline, diesel and single-motor electric excavators.

BUCYRUS ERIE

BUCYRUS-ERIE COMPANY • South Milwaukee, Wisconsin



GREATER STRENGTH of belts built with "Cordura" is illustrated above (enlarged in scale to show detail of construction). At left is cross-section of four-ply belt sinewed with "Cordura." It's stronger than conventional six-ply belt at right, yet only half as thick. This thin, light belt is particularly desirable where panel equipment is moved frequently.

WILL YOUR NEXT CONVEYOR BELT HAVE THESE FEATURES?

Here are four operating advantages you can have built in your next conveyor belt simply by asking your supplier to build it on Du Pont Cordura* High Tenacity Rayon. This is the industrial yarn that gives strength to heavy-duty truck tires and lightweight high-pressure hose. And it makes a stronger and easier-to-operate belt . . . at no extra cost.

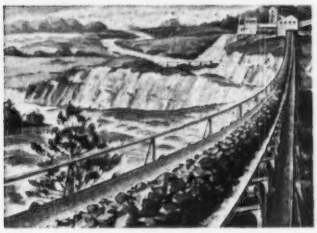
We will be glad to send you the names of suppliers of these efficient belts. You can also get full information about "Cordura" in the new manual "Sinews for Industry." It gives physical properties of "Cordura" rayon, describes many successful applications and tells how "Cordura" improves the efficiency of conveyor systems. For your free copy, address Room 4529, Rayon Division, E. I. du Pont de Nemours & Co. (Inc.), Wilmington 98, Delaware. *Reg. U. S. Pat. Off.

DU PONT "CORDURA" HIGH TENACITY RAYON

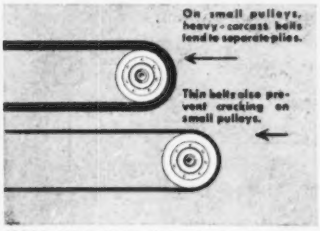
DU PONT
REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

for RAYON . . . for NYLON . . . for fibers to come look to DU PONT



SPAN LONGER LIFTS. The high tensile strength of "Cordura" rayon eliminates costly transfer points. For example, a belt reinforced with seven plies of "Cordura" can lift 1000 tons of overburden per hour up a 15° slope over 1000-foot centers. It has design tension of 900 pounds per inch of width.



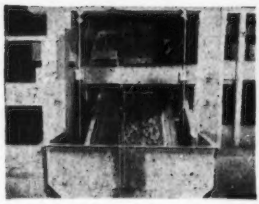
MORE FLEXIBILITY. Belts built with "Cordura" have less tendency to crack and separate plies when run over small pulleys required in confined working space. And belts built with "Cordura" have less stretch, so less take-up room is needed. And they trough well under any loading conditions.

HEAVIER LOADING CAPACITY is possible on conveyor belts built with Du Pont "Cordura" High Tenacity Rayon. This yarn is inherently stronger than the natural fibers commonly used. It packs extra strength into conveyor belts and enables them to carry loads to the capacity of power equipment.

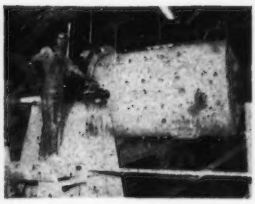
FLOTATION FOR SELECTIVE... RESULTS

ARIZONA BARITE CO. USES... DENVER FLOTATION EQUIPMENT

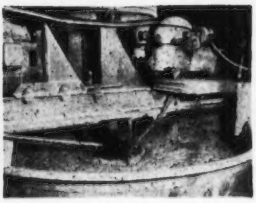
Following test work by U S. Bureau of Mines, Arizona Bureau of Mines and Deco Ore Testing Division, a selective flotation circuit was added to the Arizona Barite operation to meet market specifications for Barite used by the oil industry.



SCREENING: Note the absence of fines on this 4'x6' Denver-Dillon Vibrating Screen. Such efficient screening is produced by the "circle throw" motion of the screen.

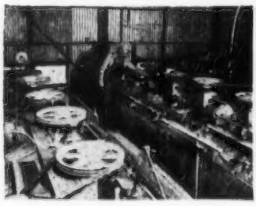


GRINDING: Up to 200 tons per day of 75% $BaSO_4$ is handled per day in this 5'x8' Denver Steel-Head Ball Mill. Ball and liner consumption is low.



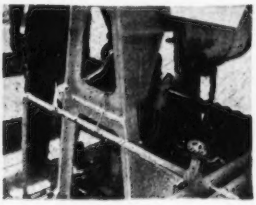
CONDITIONING: Classifier overflow is conditioned in a 5'x5' Denver Super Agitator. Flow of feed directly to agitation zone gives maximum reagent contact with pulp particles.

Complete Arizona Barite Company operating story appears in July-August 1950 Deco Trefoil. Write, wire or 'phone today for detailed information on Deco ore testing and equipment service.

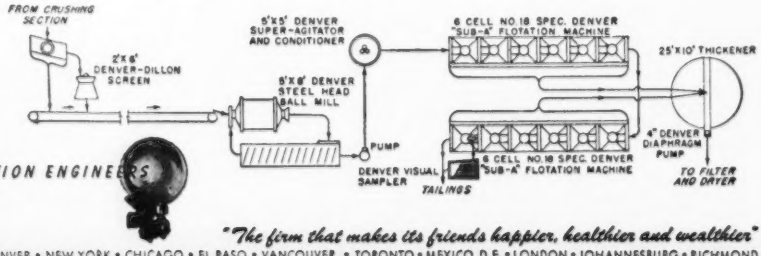


FLOTATION: Average feed per day is 125 tons of 75% $BaSO_4$. Grade of Barite is raised to 90% $BaSO_4$ in two 6-cell Denver "Sub-A" Flotation Machines operated in series.

FLEXIBILITY: Each of the 12 Denver "Sub-A" cells produce a finished high grade concentrate. Note uniform bubble structure. Flexibility permits cleaning and recleaning if ore changes.



PUMPING: A 4" Simplex Denver Adjustable Stroke Diaphragm Pump meters the flow of thickened pulp. Adjustable feature (while pump operates) permits critical Barite control.


FROM CRUSHING SECTION
2'x6' DENVER-DILLON SCREEN
5'x5' DENVER SUPER-AGITATOR AND CONDITIONER
8'x8' DENVER STEEL HEAD BALL MILL
PUMP
DENVER VISUAL SAMPLER
6 CELL NO.18 SPEC. DENVER "SUB-A" FLOTATION MACHINE
6 CELL NO.18 SPEC. DENVER "SUB-A" FLOTATION MACHINE
TAILINGS
25'X10' THICKENER
4" DENVER DIAPHRAGM PUMP
TO FILTER AND DRYER

DENVER EQUIPMENT 24 HOUR SERVICE COMPANY

FLOTATION ENGINEERS

"The firm that makes its friends happier, healthier and wealthier"

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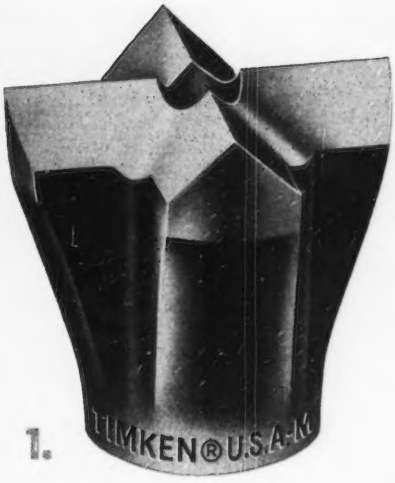

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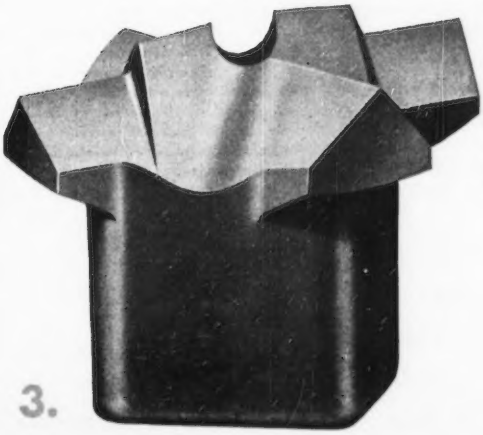


3.

Only TIMKEN® offers all 3 rock bit types

WHICHEVER type of removable rock bit is best for your drilling job, you can get it from Timken®. Only Timken makes *all three* rock bit types—multi-use, carbide insert, and one-use.

1. **TIMKEN MULTI-USE ROCK BIT** gives lowest cost per foot of hole when full increments of steel can be drilled and when control and reconditioning are correct.

2. **TIMKEN CARBIDE INSERT BIT** offers many advantages under certain conditions—including extremely hard and abrasive ground, small holes, extra deep holes. Holes go down faster, bit reconditioning is simplified.

3. **TIMKEN ONE-USE "SPIRALOCK"** bit is recommended where reconditioning is not feasible. New "Spiralock" union holds bit on dependably, permits easy removal. Steel preparation is simplified, steels last longer.

...and a complete Rock Bit Engineering Service!

To help you select the *one* best bit for your job, Timken offers a *complete* Rock Bit Engineering Service. With *all three* types of rock bits to draw upon, the Rock Bit Engineering Service can help you get the bit performance your job needs—whether it's lowest bit cost, lowest cost per foot of hole, greatest possible drilling speed, or other desired advantages.

FREE BOOKLET! For detailed information on Timken removable rock bits, write on your company letterhead for this newly published rock bit booklet. The Timken Roller Bearing Company, Rock Bit Division, Canton 6, Ohio. Cable address: "TIMROSCO".

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

your best bet for the best bit

. . . for every job

Long, Long Trail—CUT SHORT

Continuous, large volume flow of ore, nearly a million tons per year, travels over this S-A designed conveyor system to cut short the long, long trail formerly made by trucks from the open pit to processing plants.

Typical of the many open-pit ore handling systems S-A engineers have designed and built during the past 50 years, this system moves ore faster at lower cost per ton and with less effort. Whatever your bulk handling problem may be . . . depend on S-A engineers to supply an efficient, economical conveying system . . . designed and equipped to meet your specific requirements.

Submit your bulk materials handling problems for the recommendations of S-A engineers. This service costs you nothing . . . Write today.

MINNESOTA IRON RANGE MINE

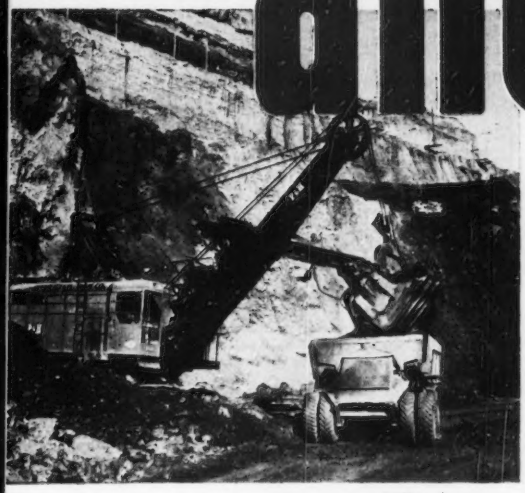
From the open pit of this mine on the Minnesota Iron Range, ore travels on an S-A designed conveyor system 1750 feet to preparation and sintering plants at the surface near the edge of pit. S-A "PACIFIC" type carriers are used with S-A Impact Carriers under the feed point. Approximately 100,000 tons of ore pass over this 30" wide belt conveyor system each month during the 7 or more months of operation each year.

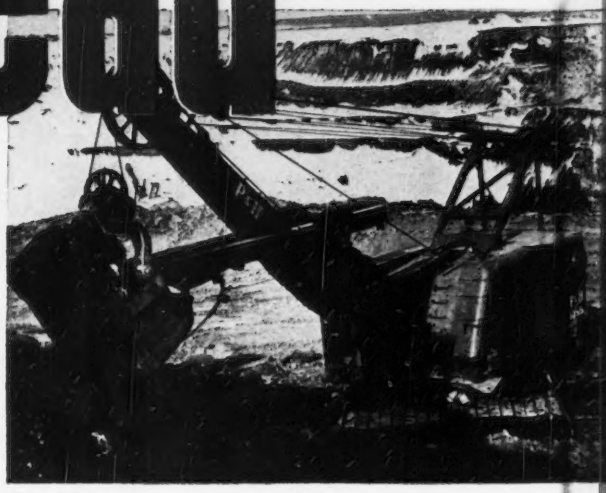
STEPHEN S-A DAMSON MFG. CO.

4 Ridgeway Avenue, Aurora, Illinois · Los Angeles, Calif. · Belleville, Ontario

DESIGNERS AND MANUFACTURERS OF ALL TYPES OF BULK MATERIALS HANDLING EQUIPMENT

low costs ahead





with P&H ELECTRIC SHOVELS

Better shovels mean better production in every way. And here's another team of P&H Electrics that are proving it. They're faster, of course. P&H Magnetorque* Hoist gives you smoother, livelier dipper action with electro-magnetic power. There's no friction, no wear.

You'll find some other important differences in P&H design . . . including the husky all-welded construction that gives you greater strength to withstand shock loads—and the increased electrical efficiency that gives kilowatts a new incentive. They all add up to the steady, dependable operation that lets you maintain schedules and cut tonnage costs for years to come.

On a major investment of this kind, you should *know* how much more P&H Electric Shovels give you. Ask for the facts. Write today!

*Trade-mark of Harnischfeger Corporation for electro-magnetic type clutch.

Here's another team of P&H Electric Shovels at work on the Mesabi Range. They're owned by a prominent mining company at Virginia, Minnesota. At left is a P&H Model 1400 (4 cu. yds.). At right is a new P&H Model 1055 Electric Shovel (3 cu. yds.) which incorporates all of the famous P&H features.

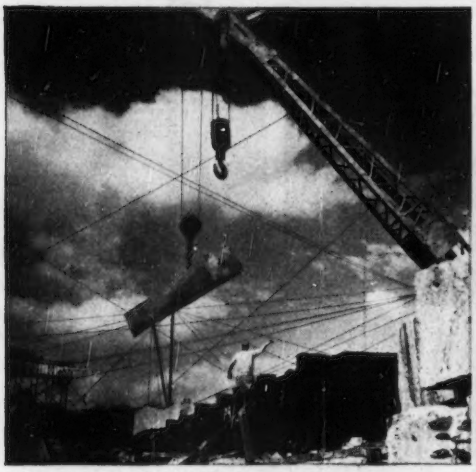
P&H ELECTRIC SHOVELS
4454 W. National Ave.
Milwaukee 14, Wisconsin
HARNISCHFEGER CORPORATION

Every third P&H Electric Shovel sold is a repeat order

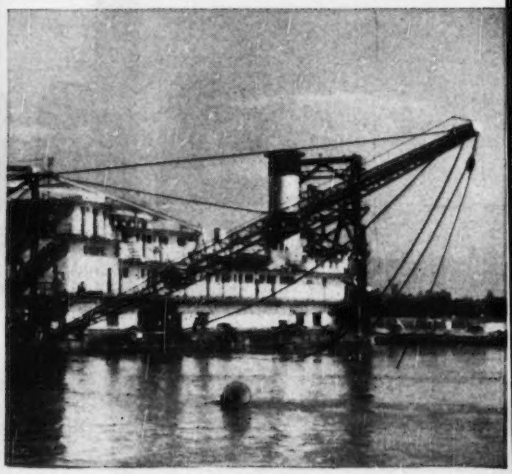
ATORS • OVERHEAD CRANES • HOISTS • ARC WELDERS and ELECTRODES • SOIL STABILIZERS • CRAWLER and TRUCK CRANES • DIESEL ENGINES • CANE LOADERS • PRE-ASSEMBLED HOMES

FOR JOBS LIKE THESE...

You've got to have a rope with guts



HIGH, WIDE AND HANDSOME. Quarries need wire rope that will run fast, support tremendous weight. This photograph shows TIGER BRAND Wire Rope used for derrick and mast guys, and hoisting ropes, in a nationally-known quarry.



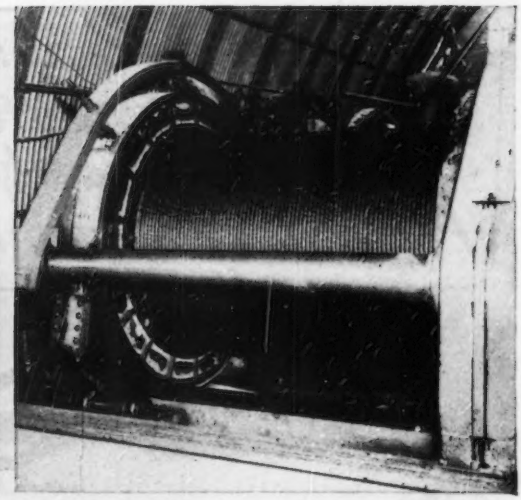
WET AND MUCKY. TIGER BRAND Wire Rope furnishes the muscles for this big Mississippi dredge. Constantly in and out of water . . . subjected to extreme loads . . . TIGER BRAND delivers economical heavy-duty service that pays off in fewer rope replacements.

A ROPE'S TOUGHEST DIGGING JOB. Dust and grit spell short life for inferior rope—if it's used in strip mining. But you can count on TIGER BRAND Wire Rope to give matchless performance under the toughest operating conditions.

TIGER WIRE ROPE SLINGS

We can furnish a complete line of 8, 6, 4-part and laid slings as well as all standard and special wire rope fittings. Choose from our standard selection or, if you have a special problem, we'll make special slings to your specifications. Write for our free booklet, "American Tiger Wire Rope Slings."

OUT GOES THE OVERBURDEN. Stripping overburden usually means high shock stresses on the rope. TIGER BRAND Wire Rope—made in the widest variety of styles—is available to meet unusual conditions of shock . . . abrasion . . . high loads.



READY FOR A WORKOUT. TIGER BRAND Wire Rope has the flexibility to withstand constant coiling and uncoiling. When properly lubricated and maintained, TIGER BRAND Wire Rope will give you dollar for dollar service that can't be beat by any other wire rope.

FOR HIGH STRENGTH, GREAT FLEXIBILITY AND A COMPLETE RANGE OF SIZES AND STYLES—USE

TIGER BRAND WIRE ROPE

Judge it by the jobs it handles!

Most premature rope failures can be traced to improper selection, maintenance or installation.

Your TIGER BRAND field service engineer can help you with all these problems. A skilled engineer, he has access to a tremendous file of case histories. He knows how to pick the *best* kind of wire rope for your own job—the type of core, the kind of steel, the construction, the lay and the finish—all things that must be considered for top performance.

Your TIGER BRAND field service engineer will do more than help you select the rope. He'll show you how to use it most effectively with your running equipment. He might, for example, suggest that you use:

MANGANESE STEEL SHEAVES TO INCREASE ROPE LIFE

Soft steel sheaves can cause trouble. Tiny slivers of metal become imbedded in the rope and "grind" it until it fails. Furthermore, the rope will cause corrugations in the sheave. In turn, these corrugations can ruin the rope that caused them. Manganese steel sheaves actually harden and polish themselves under severe pressure and friction. So they continuously present a smooth surface to the rope—and lengthen its life.

If you have a special application that's tough on wire rope, get in touch with your TIGER BRAND field service engineer. Meanwhile, you'll find a wealth of knowledge in our information-packed handbook, "American TIGER BRAND Wire Rope." Write for it today.

AMERICAN STEEL & WIRE COMPANY, GENERAL OFFICES: CLEVELAND, OHIO
COLUMBIA STEEL COMPANY, SAN FRANCISCO
TENNESSEE COAL, IRON & RAILROAD COMPANY, BIRMINGHAM
SOUTHERN DISTRIBUTORS
UNITED STATES STEEL EXPORT CO., NEW YORK

USS TRADE MARK

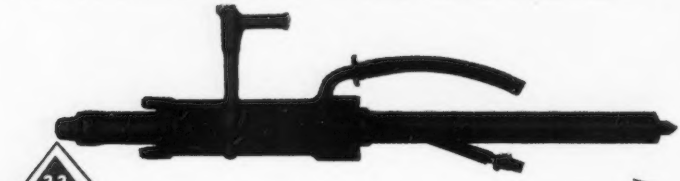
AMERICAN TIGER BRAND WIRE ROPE

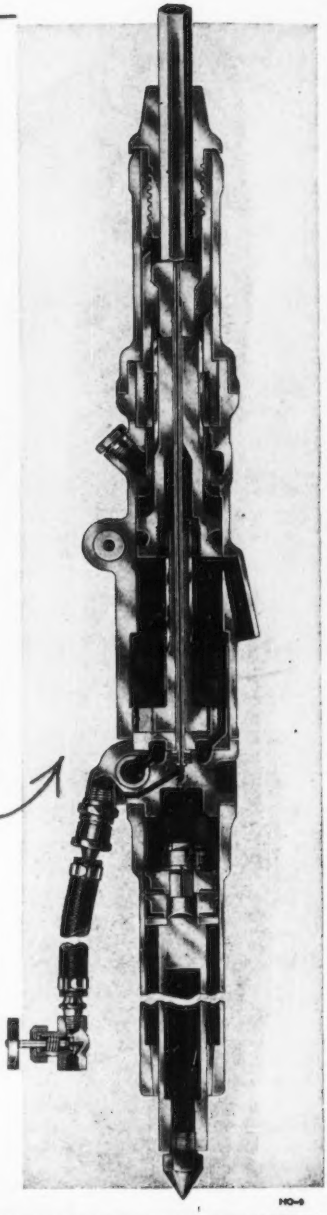
Excellay Preformed

UNITED STATES STEEL

HERE'S PROOF THAT

Only Blue Brute Stopers Handle So Easily... Perform So Economically!





BETTER BALANCE

A Blue Brute EXCLUSIVE

If you've never realized before how much stopers differ in the vital matter of *balance*, look at the results of this simple test, made on the Blue Brute Self-Rotating WR-31 and its two leading competitors. When the three stopers were suspended by their handles, the following weights on the chucks were required to bring each chuck to horizontal:

Blue Brute	— 33 lb.
Stoper A	— 24 lb.
Stoper B	— 0 lb.

With its operating handle set well above the center of gravity, the Blue Brute WR-31 has by far the *best working balance* for easy handling. Wrestling with a top-heavy stoper slows a runner down, sends your costs up. Give him a *correctly balanced* WR-31 and he'll make up for lost time!

POSITIVE-ACTING VALVE

A Blue Brute EXCLUSIVE

Sleeve-type, with large bearing surfaces, for minimum wear over extra-long service life. The leakproof end seats improve with age, while circumferential laps keep air from reaching both ends of the piston hammer at any stage of the cycle. And the port thrown valve both ways assures positive action on the hammer on both forward and rearward strokes. Typical of Worthington leadership in rock drill design, this jet valve keeps the WR-31 drilling faster and cleaner on very little air!

Many other WR-31 advantages . . . like the shielded, down-directed exhaust, and the constant air stream keeping sludge and water out of the shielded chuck . . . mean your runners can drill easier, faster, more profitably for you on every job. . . . Let an on-the-job demonstration prove to you that there's more worth in a Blue Brute. *And write for literature describing the complete line of Blue Brute Mining Equipment.*

BUY BLUE BRUTES

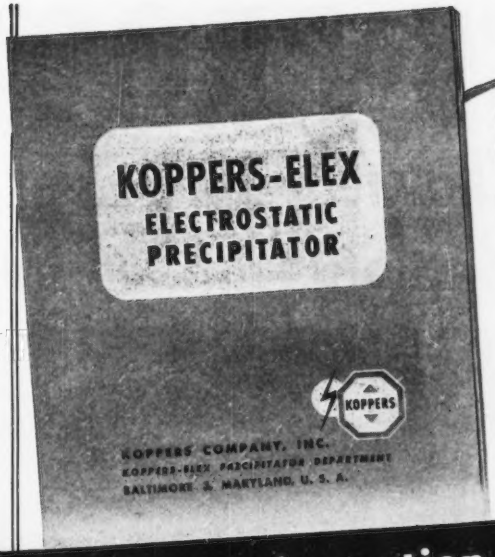
Semi-Portable Compressors. Drifters with Feed Motor Incorporated. Drifters with Feed Motor on Shell. Hand-Crank Drifters. Stopers. Hand-Held Rock Drills.

WORTHINGTON

Worthington Pump and Machinery Corporation
Mining Drill Sales Division
Holyoke, Massachusetts

Booklet Describes How...

One factory specified 97% efficiency, but actually gets over 99% efficiency!



SEND FOR THIS VALUABLE FREE FOLDER!

Gives vital information on how to make recovery, gas cleaning and nuisance abatement pay off!

Improved power units save money on installation cost.

•

Sequential rapping provides uniform stock discharge.

•

Insulators, protected from gas stream, require minimum maintenance and replacement!

•

High efficiencies are obtained around-the-clock for a full 24 hours a day!

•

New engineering on certain industrial gas applications enables recovery to pay up to 75% annual dividend on original cost!

•

Koppers-Elex provides for lowest possible pressure loss.

•

You can get both specified efficiency and residual content left in gas unconditionally guaranteed!

● No matter if your plant now uses precipitators, or plans to install one in the future—send for this timely folder! It's packed with performance and engineering data. Gives facts on maximum efficiency, shows how recovery, nuisance abatement or gas cleaning can PAY OFF!

Your copy contains illustrations, design information, facts about proper rapping, collecting and maintenance—all vital information collected by the Koppers Company in more than 60 years' manufacture of high-efficiency gas cleaning equipment.

To get your free copy, just fill out and mail the coupon below. There is no obligation. Check which field interests you most and mail coupon to the Koppers Co., Inc., Koppers-Elex Precipitator Dept., 270 Scott St., Baltimore 3, Maryland. We have only 1000 copies on hand, so to make sure you get yours—please mail the coupon today.

Mail this Coupon Today for Your Free Copy!

KOPPERS CO., INC.
KOPPERS-ELEX PRECIPITATOR DEPT.,
270 SCOTT STREET, BALTIMORE 3, MARYLAND

Gentlemen: Please send me your free booklet. I understand there is no obligation.

NAME.....

TITLE.....

COMPANY.....

ADDRESS.....

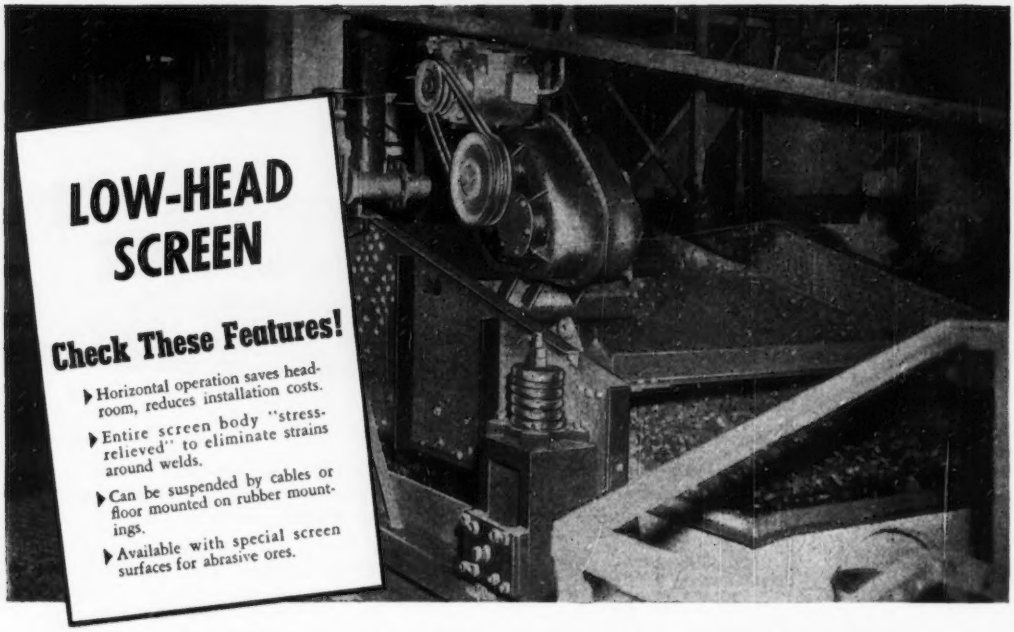
CITY.....ZONE.....STATE.....

Please check which field interests you most:

☐ Recovery ☐ Nuisance Abatement ☐ Gas Cleaning

HERE'S PROOF-

Why Allis-Chalmers Sink-Float Screens are Accepted as Standard on Iron Range


LOW-HEAD SCREEN
Check These Features!
Horizontal operation saves headroom, reduces installation costs.
Entire screen body "stress-relieved" to eliminate strains around welds.
Can be suspended by cables or floor mounted on rubber mountings.
Available with special screen surfaces for abrasive ores.

FOR THE TOUGH job of handling iron ore in sink-float, operators have chosen *Low-Head* vibrating screens. *In fact, every sink-float plant on the iron range uses these Allis-Chalmers screens for this job!*

Some of the reasons: Top performance . . . high media recovery! Maintenance reduced to practically no downtime. And operators know Allis-Chalmers heavy construction pays off in years of service!

The *Low-Head* screen shown above is a typical heavy media screen installation. One of eight *Low-Head* screens installed in the sink-float plant at Holman mines, Taconite, Minn., this 6x16 ft single deck screen is used in the wash and drain process here. It washes media from iron ore concentrate . . . recovers expensive ferro-silicon for re-use.

Allis-Chalmers builds a complete line of vibrating screens—for every application from heavy duty scalping of run-of-mine ore to screens for making fine separations.

There is an Allis-Chalmers representative near you who will gladly look over your operations, show you how proper screening equipment may help you reduce your operating costs. Call him, or send for **Bulletin 07B6330B.** A-3041

ALLIS-CHALMERS, 969A SO. 70 ST. MILWAUKEE, WIS.

ALLIS-CHALMERS

Low-Head and *Texrope* are Allis-Chalmers trademarks.

Sales Offices in Principal Cities in the U. S. A. Distributors Throughout the World.

Motors

Controls

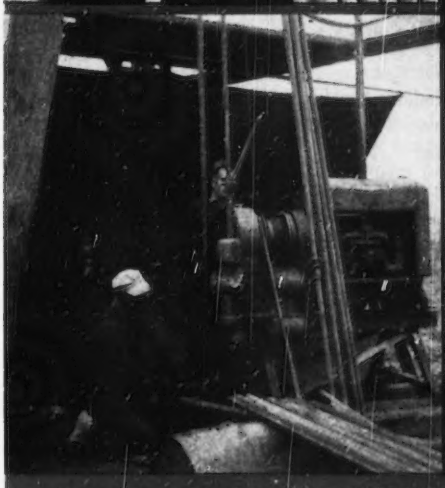
Texrope Drives

Vibrating Screens

Crushers

Kilns, Coolers, Dryers

Service... your interests of first importance—



There are 2 ways of doing your diamond drilling

One is to do it yourself.
The other is to contract it.

Doubtless you ask yourself "which is the better way for me?" The decision, of course, rests with you, but first consider how your own best interests will be served by contracting your drilling to Longyear. Here are some of the specific advantages:

1. Your job is studied from your viewpoint, and the objectives to be accomplished. Your interests are of first importance.

2. The right drill for efficient work will be selected for your job. This saves you an investment in equipment.

3. Experienced drill crews carry on under competent direction. They are resourceful in handling complex drilling problems. Competency saves you money, because delays due to inexperienced operators are eliminated.

4. Longyear improved coring equipment gives you the best core recovery possible in any given formation . . . *CORES TELL THE STORY.*

Decide to have Longyear demonstrate the above advantages on your job. Our Contract Drilling Division will respond to your call.

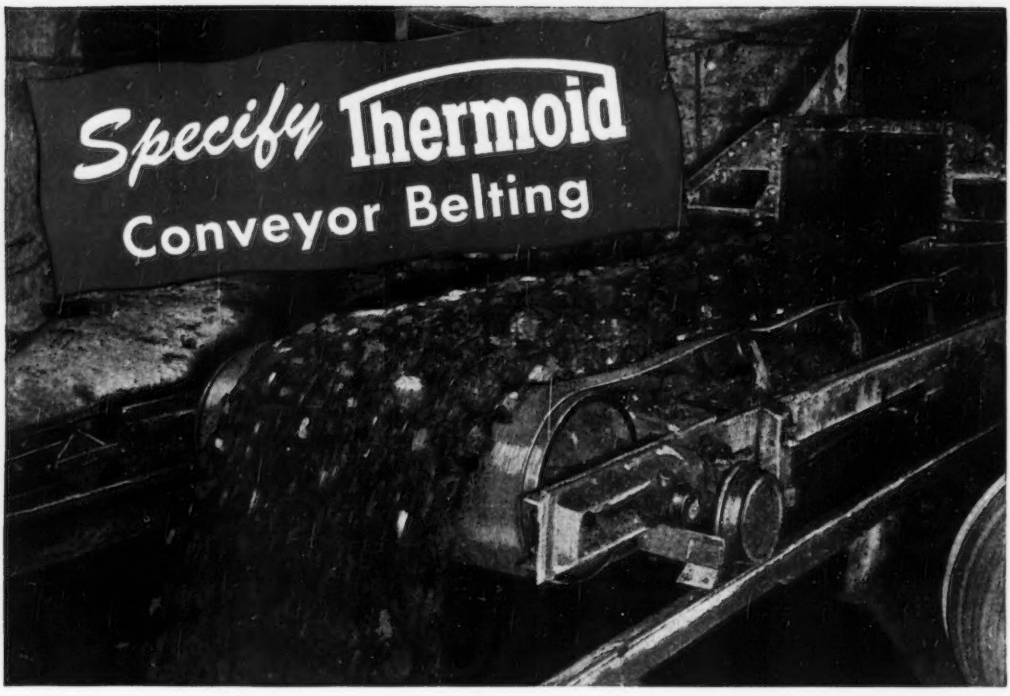
E. J. LONGYEAR COMPANY

MINNEAPOLIS, MINNESOTA, U.S.A. NEW YORK OFFICE: 1775 BROADWAY

CANADIAN LONGYEAR, LIMITED, NORTH BAY, ONTARIO, CANADA

DIAMOND CORE DRILLS • CONTRACT CORE DRILLING
SHAFT SINKING • GEOLOGICAL INVESTIGATIONS

REPRESENTATIVES IN PRINCIPAL MINING CENTERS IN THE UNITED STATES AND OTHER COUNTRIES



Thermoid Shuttle Belts Feed Tons of Coal to Surge Bins . . . Cut Conveying Costs!

Thermoid Belting is a consistent cost-cutter because it carries maximum tonnage, requires little maintenance, and stands up under plenty of punishment.

Whether the job is handling ore, coal or rock, Thermoid Conveyor Belts stay on the job—long after other belts fail. Fewer delays due to belt-breakage . . . belt-slippage . . . premature wear and tear.

Your Thermoid Distributor carries a complete stock to meet your requirements. Thermoid Field Representatives are available to help you select the right Thermoid Belting for your job. Broad experience in *all* fields of industry equip Thermoid Engineers to recommend the belt that can best perform the tasks you assign it in your daily operations.

It will pay you to

Specify Thermoid

For economy, strength, load-capacity, your belting dollars buy more potential operating profit with Thermoid.

Thermoid Quality Products: Transmission Belting • F.H.P. and Multiple V-Belts • Conveyor Belting • Elevator Belting • Wrapped and Molded Hose • Molded Products • Industrial Brake Linings and Friction Materials.

Thermoid Company

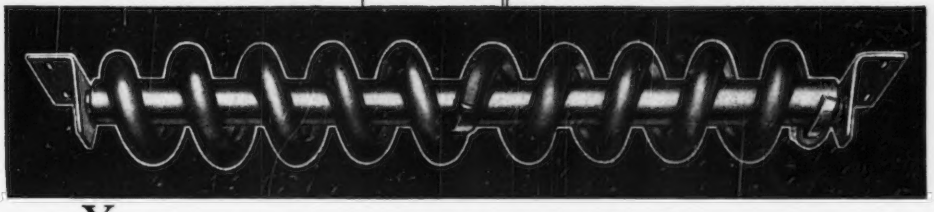
Main Offices and Factory • Trenton, N. J., U. S. A.
Western Offices and Factory • Nephi, Utah, U. S. A.
Industrial Rubber Products • Friction Materials • Oil Field Products

this record proves

THE RETURNS FROM REX SPIRAL RETURN IDLERS

COST RECORD (In a large western coke plant)

TYPE OF IDLER	**Steel**	**Rubber Covered Spiral**
SERVICE LIFE	**3 months**	**12 months**
COST 1st YEAR	**$66.80 for 4**	**$47.70 each**
SAVING 1st YEAR		**$19.10**
Cost of Replacement		
Subsequent Years (per year)	**$66.80 for 4**	**$18.20 each** (rubber covering)
SAVING per year after 1st YEAR		**$48.60**



Yes, the cost record from *just* this one plant clearly demonstrates the savings possible through the installation of Rex Rubber Covered Spiral Return Idlers.

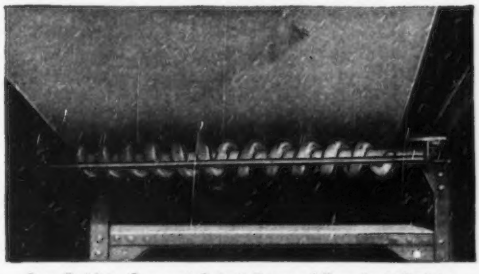
Before the installation of these cost-cutting idlers, the abrasive action of coke breeze clinging to the return side of the belts wore out the standard steel return idlers in an average 3-month period.

15 Rex Spiral Return Idlers were installed for trial and have given at least 12 months' service—4 times longer than the steel idlers. These idlers provide a constant, ever-changing point of contact between idler and belt, preventing build-up of material on the idler and, in some cases, helping to clean the belt.

Cost records show that the 15 Rex Spiral Return Idlers made possible a saving of $19.10 per idler and $286.50 total saving, including initial and installation costs. After the first year, the spiral rubber covering can be replaced, if worn, at a cost of $18.20 per idler. This cost as compared to $66.80, the cost of 4 new steel return idler rolls, indicates a saving after the initial year of $48.60 per year.

Add to these savings, the elimination of down-time caused by the frequent replacement of steel idler rolls, which makes the cost-cutting advantages of Rex Rubber Covered Spiral Return Idlers even more obvious.

Why not investigate the advantages of Rex Spiral Return Idlers and the other idlers in the Rex Line for your operations? Mail the coupon for your copy of Bulletin No. 463R.



Rex Rubber Covered Spiral Return Idlers installed in this western coke plant delivered 4 times longer service than conventional steel return idlers previously used.

CHAIN BELT REX COMPANY — BELT CONVEYOR IDLERS

Chain Belt Company
1679 W. Bruce Street
Milwaukee 4, Wis.

Please send me a copy of Bulletin 463R.

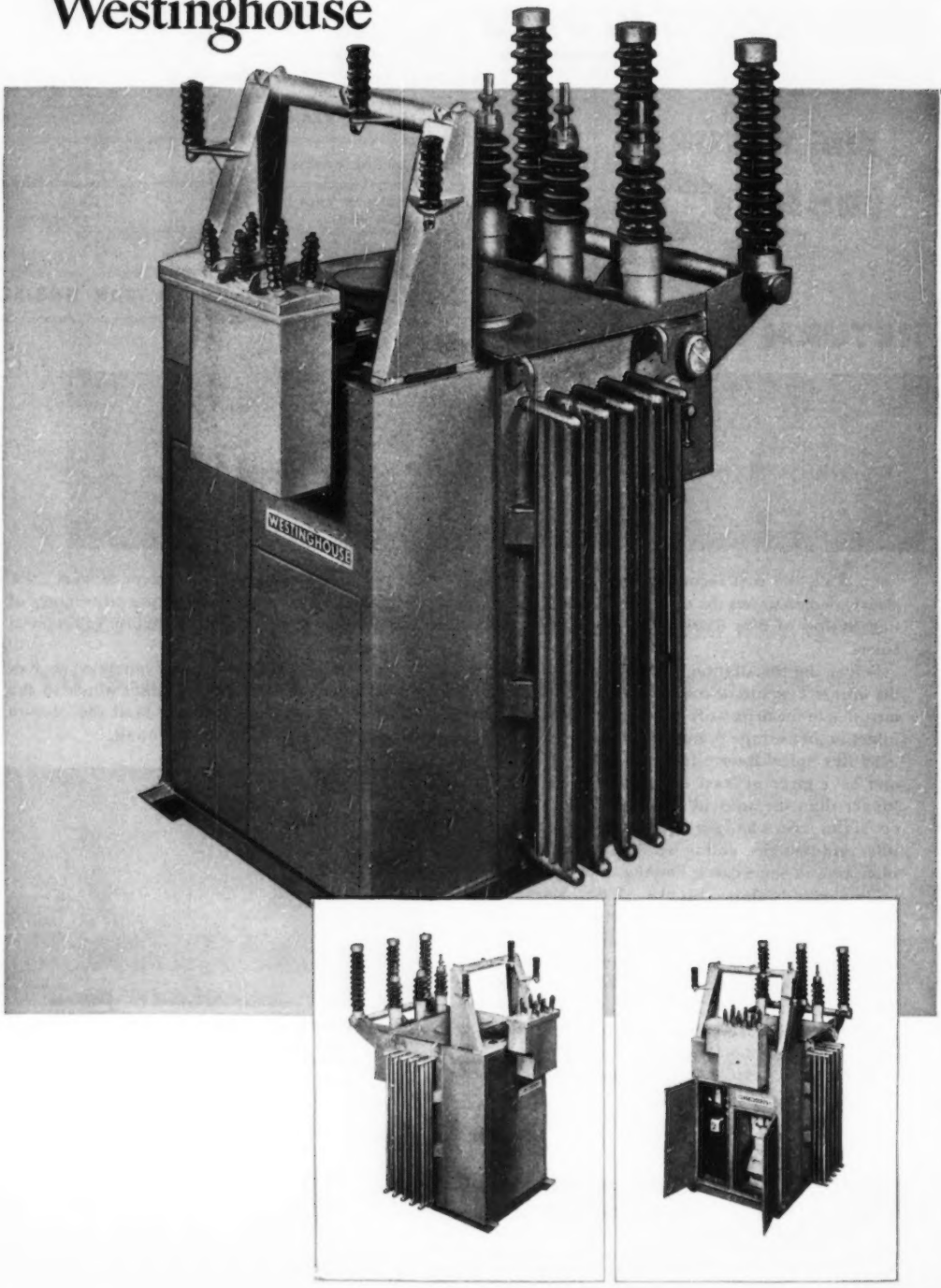
Name.....

Company..... *Dept*.....

Address.....

City..... *State*.....

YOU CAN BE SURE.. IF IT'S
Westinghouse



The JUNIOR "CSP"

POWER TRANSFORMER

NEW ECONOMY

...for small capacity substations

Here's the substation that fills a long apparent need in the power distribution field . . . a smaller, yet complete, substation with integral high and low-voltage switchgear as well as metering equipment. And what's more, it's "CSP" (Completely Self-Protecting), with both thermal and lightning protection built in.

Designed for small towns and similar areas where the capacity of the feeder does not justify a larger rated "CSP" Power Transformer, the new "CSP" JUNIOR provides all the advantages of compactness, simplicity and ease of operation . . . PLUS *low cost.*

Available in 300 to 1000-kva ratings. For further information on all ratings of "CSP" Power Transformers, contact your Westinghouse representative, or write for Booklet B-4692. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-70572

Westinghouse

TRANSFORMER EQUIPMENT

$25,000,000 Bull's-eye

and now a new, improved airborne magnetometer

In 1947 Aero Service hit a $25,000,000 bull's-eye with one of the first commercial airborne magnetometer surveys ever made. In a few short weeks Aero's crew covered thousands of square miles and collected exact magnetic data that would have taken years to assemble by ground methods. Information recorded on this pioneer magnetometer study proved so significant that the mining company dispatched its geologists for ground studies in areas surveyed only 24 hours before. Based on the findings of this aerial survey, the company moved ahead with a multi-million dollar development program years earlier than their plans had contemplated.

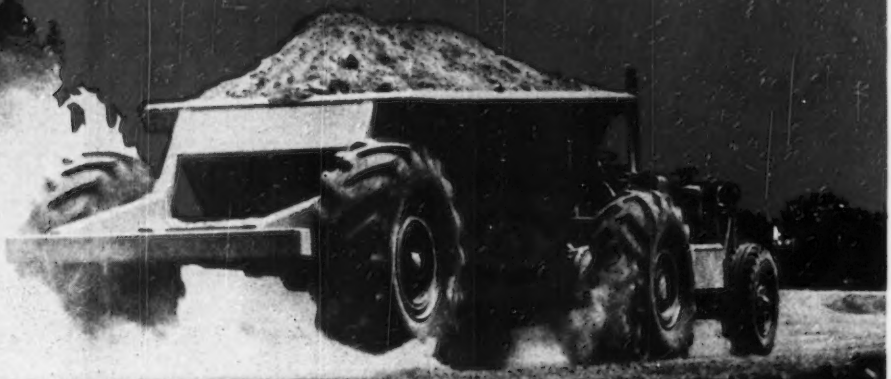
Today, after three years and more than half a million square miles of successful aerial magnetic surveys in many parts of the world, *a better, even more accurate magnetometer is now available to the mining industry*. It opens new horizons in approaching mineral explorations.

Developed by Gulf research ingenuity and tested in the field by Aero Service experience, the improved magnetometer adds a greater degree of certainty to the worldwide search for new mineral resources. It is essentially drift-free and capable of swifter response. As a result, it produces a more precise magnetic record, accurate to variations as small as 1 gamma. This information, translated into exact magnetic intensity maps by Aero, will furnish mining companies with the most accurate magnetic exploration guideposts ever made. For Aero's 30 years' mapping experience assures you of precise correlation of magnetic data and ground position.

Why not call an Aero engineer in for a confidential discussion with your staff? Let us show you how the improved Gulf airborne magnetometer in the skilled hands of Aero men can apply to your particular exploration problem. Write Aero Service, today.

TOPOGRAPHIC MAPS • PLANIMETRIC MAPS • PRECISE AERIAL MOSAICS • AIRBORNE MAGNETOMETER SURVEYS • RELIEF MODELS • COLOR PHOTOGRAPHY

Here's Where SPEED PAYS OFF!



YOU CAN MOVE BIG LOADS FASTER on Firestone TIRES

SPEED on the job means profit on the job. You know how much more money you make when you move big loads fast—without profit-killing down-time.

You pile up yardage faster and cut the down-time with Firestone Tires on your equipment. Because their treads are so designed to provide greater productive efficiency and the cord body so engineered to stand up under big loads and high speed operations, Firestone Tires take the roughest punishment and still keep your payloads moving.

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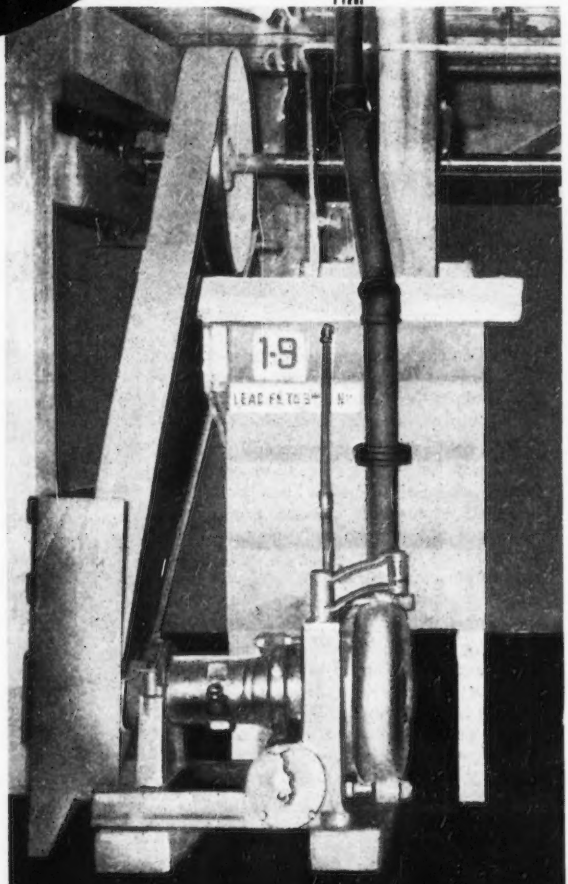

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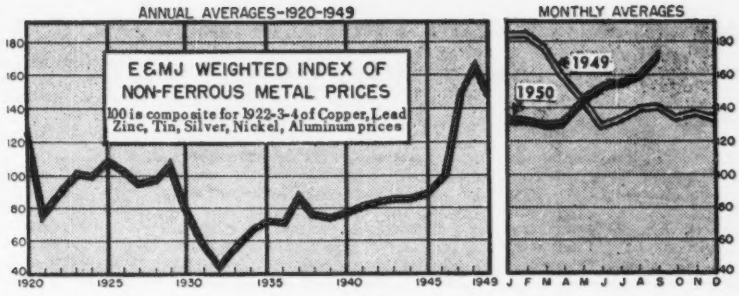
PRICES



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MARKETS

Get-while-the-getting-is-good still motivates most buyers of strategic metals. The abnormal demand grows out of the unchecked civilian economy and the rising tide of military orders. Costs, and prices, of metals are moving higher. The E&MJ index of non-ferrous metal prices jumped from 160.67 (revised) in August to 172.56 in September, a new high since the climb began last April. Copper, lead, zinc, and aluminum were all higher.

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LABOR

If Philip Murray's Steelworkers get the wage boost they expect before Jan. 1, it will mean higher metal mine wages and higher metal prices. If, as is rumored, Washington tries a metal price roll-back to June, 1950, levels, higher wage costs at many mines would force a swing to subsidies.

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AT HOME

Control over distribution is coming in copper and zinc and the light metals. Although victory in Korea may slow the defense effort somewhat, it won't halt the inflationary spiral short of another turn or two. Credit controls will cut civilian spending, but not until next year.

Despite the Defense Production Act's implication that voluntary controls should be tried before compulsion, Administration officials seem bent on moving right into Government control where controls are needed.

But the tide of events is rolling over the framework of control over metals and minerals. Machinery isn't being put into motion fast enough to meet developing situations. Our guess is that make-shift will follow make-shift for several months. We can't tell you whom to see in Washington. Washington, itself, doesn't know.

Republic Steel and Armco may be first in the field with full-scale taconite pellet production. With Oglebay, Norton as manager, they'll build a $60-million plant on their Reserve Mining Co. holdings. Reserve is supposed to hold about 60% of all magnetic taconite lands on Minnesota ranges. Pickands, Mather is still in the race with a taconite pilot plant, now making pellets, they've been running for over two years.

•

ABROAD

Denmark, having decided to work that recently discovered **Greenland lead orebody** herself, hopes to begin mining it next year. American engineers figure it will be nearer three years.

World demand for U. S. gold, which began with the Korean war, has subsided. Foreigners feared a U. S. freezing of their funds; they weren't deserting the dollar. However, the key to a change in the Government's gold policy lies in the U. S. public's confidence in the dollar.

MARKETS—Trends and Prices

Inventory Control Order Fails to Halt Rush for Non-Ferrous Metals—Prices Generally Higher

HIGH GOVERNMENT OFFICIALS made it clear that shortages of critical materials for the civilian economy would increase and controls over distribution of the available supply will come soon in copper, zinc and the light metals. Export controls on copper, zinc, lead and aluminum have been tightened in that validated licenses are necessary to prevent undue drain on home supplies.

Emergency inventory controls on some 32 items were put into effect on Sept. 18 by the National Production Authority. Fabricators are obliged to limit their stocks of the controlled materials to a practical minimum working inventory. Metals and minerals included in the inventory order are iron and steel; aluminum; columbium; cobalt; copper; magnesium; manganese; nickel; tin; tungsten; zinc; and non-ferrous scrap. The order reduced outside speculative activity and eased the scrap situation in some metals.

Threat of more drastic controls only served to further stimulate the demand for non-ferrous metals. Buyers throughout September called for tonnages of nearby metal that simply could not be supplied. Prices were of secondary importance and premiums over the producers' selling basis were paid that were strongly reminiscent of black market operations of the war period.

The E & M J index of non-ferrous metal prices rose from 160.67 in August to 172.56 in September, reflecting higher averages for copper, lead, zinc, and aluminum. Higher prices also obtained last month in quicksilver, antimony, platinum, and cadmium. One producer advanced selenium to $3 per pound because of an expanding use for the metal.

The Federal Reserve Board's index of industrial activity advanced in August to 207% of the 1935-39 average. The preliminary figure for September is 212, the highest since June, 1945.

Copper Duty Sticks

Congress adjourned Sept. 23 without taking action on the suspension of the 2c. import duty on copper. However, renewed effort to lift the duty for a limited period is expected when Congress convenes after the November elections are out of the way. As matters stand, domestic consumers of foreign copper will pay the 2c. tax until the issue is settled.

Demands for copper were enormous in this country and expanding abroad, with no appreciable increase in mine output in sight. The price situation here remained confused throughout September. Over most of the month all sellers, excepting Kennecott and Phelps Dodge, were at 24½c. per pound, delivered. Phelps Dodge moved up its price to 24½c. late on Sept. 26. Kennecott announced that it would raise its selling basis to the higher level beginning Oct. 2. Our weighted daily averages on copper reflect the selling at both levels.

Foreign copper sold during September on the basis of 24½c., f.a.s. New York on all but three days, the 14th, 15th, and 16th, when business was booked at both 22½c. and 24½c.

United States production of crude (primary and secondary) amounted to 89,207 tons in August, against 85,378 tons in July. Production of refined copper in this country amounted to 108,465 tons in August, against 96,734 tons in July. Deliveries of refined copper during August to domestic consumers totaled 112,083 tons. In addition, the stockpile absorbed 13,424 tons.

Apparent consumption of copper in the United States during August, based on shipments of products containing copper by fabricators, totaled 136,860 tons, the largest total for any month since January, 1947.

Unfilled Orders Up

Deliveries by fabricators to customers, and unfilled orders for copper products, in terms of copper contained, in tons, for the eight months ended August:

	Fabricators' Deliveries	Unfilled Orders
January	108,921	175,926
February	102,896	196,010
March	106,644	200,495
April	124,032	198,399
May	133,365	217,319
June	132,758	212,400
July	97,978	205,430
August	136,860	335,155

Some 80,000 tons of lead were sold during September. The price scored a gain for the month of 1c. per pound, establishing the New York market at 16c. on the common grade. Following publication of the Government's inventory order, offerings of scrap increased and tension over the immediate supply outlook eased. The undertone of the market for primary metal remained firm, owing largely to the sold up condition of producers. In the export market, prices advanced to 16c. and 16¼c., f.a.s Gulf ports. Offerings of foreign metal diminished.

The supply situation in zinc worsened. Though every effort was made to take care of customers with a view toward maintaining operations at fabricating plants in distress, difficulties over satisfying buyers mounted. Hope of handling the situation on a strictly voluntary basis appeared slim as the month ended.

Zinc at 17½c., E. St. Louis

With mine operators holding back on concentrates, and premium prices prevailing in the outside market, a mid-western producer raised its price 2½c. per pound on Sept. 7. Other sellers soon followed, establishing the quotation on Prime Western at 17½c. per pound, East St. Louis.

In the Tri-State concentrate market the price on coarse and flotation, basis 60% zinc, was advanced to $115 per ton, retroactive to Sept. 1.

Production of slab zinc in August

Average Prices for September (E&MJ Quotations)

Copper:	
Electrolytic, Domestic, Refinery	22.900
Electrolytic, Export, Refinery	24.299
Lead:	
Common, New York	15.800
Common, St. Louis	15.600
Silver and Sterling Exchange:	
Silver, New York, per. oz.	72.750
Silver, London, pence per oz.	63.500
Sterling Exchange, "Checks"	280.000
Zinc:	
Prime Western, East St. Louis	17.100
Tin:	
New York Straits	101.250
New York, 99% min. (e)	100.250
Gold, per oz. U.S. price	$35.000
Quicksilver, per flask	$84.200
Antimony (E&MJ) (d)	34.300
Antimony, bulk, Laredo	31.020
Antimony, in cases, Laredo	31.520
Platinum, refined, per oz.	$97.200
Cadmium (a)	229.000
Cadmium (b)	239.300
Cadmium (c)	249.600
Aluminum, 99% plus, ingot	17.860
Magnesium, ingot	22.580
Nickel (f)	48.000

Domestic quotations, unless otherwise stated, are in cents per pound. Sterling exchange, checks, in cents. Quicksilver, per flask of 76 lb.

(a) Cadmium average based on the producers' quotation.

(b) Cadmium average based on the average of the producers' and platers' quotation.

(c) Cadmium average based on platers' quotation

(d) Domestic, 5 tons or more but less than carload lot, packed in cases, f.o.b. New York.

(e) Tin contained.

(f) F.o.b. Port Colborne, U. S. duty included.

was 73,399 tons. Total deliveries amounted to 79,365 tons, of which consumers here obtained 69,073 tons. Stocks in the hands of producers at the end of August amounted to only 14,451 tons.

Tin prices were sensitive to developments in the Far East. Prompt Straits quality tin averaged slightly more than $1.01 per pound, New York. Speculative activity moderated toward the close of the month.

The light metals moved into a strong position on rising costs. Effective Sept. 25, Aluminum Company of America advanced its quotation on 99% plus aluminum 1½c. per pound, establishing the quotation at 19c. on ingot and 18c. on pig, f.o.b. shipping point.

Dow Chemical Co. advanced magnesium 2c. per pound, effective Sept. 30. This raises the price on ingot to 24½c. per pound, f.o.b producer's plant.

Quicksilver advanced $7 per flask on reduced offerings in anticipation of a more active demand developing because of the defense program. Toward the close quotations ranged all the way from $87 to $93 per flask, depending on quantity and seller.

Refined platinum advanced sharply on heavy buying for the jewelry trade as well as outside speculative activity.

Tungsten ore was sharply higher as offerings almost dried up completely. Manganese and chrome ores were firmer. (*Continued on page* 107)

Major Metals

U. S. DAILY AND AVERAGE PRICES

	Electrolytic Copper (a) Domestic	(b) Export	Straits Tin New York	Lead New York	Lead St. Louis	Zinc East St. Louis
Sept., 1950						
1	23.450	24.425	97.500	15.000	14.800	15.000
2	No Market	24.425	97.500	15.000	14.800	15.000
4	Holiday	24.425	Holiday	Holiday	Holiday	Holiday
5	23.400	24.425	95.500	15.000	14.800	15.000
6	23.500	24.425	97.500	15.000	14.800	15.000
7	22.800	24.425	99.000	15.000	14.800	17.500
8	23.100	24.425	99.000	16.000	15.800	17.500
9	No Market	24.425	99.000	16.000	15.800	17.500
11	23.200	24.425	100.500	16.000	15.800	17.500
12	22.575	24.425	101.250	16.000	15.800	17.500
13	22.875	24.425	102.000	16.000	15.800	17.500
14	22.800	23.075	103.000	16.000	15.800	17.500
15	22.800	23.925	103.000	16.000	15.800	17.500
16	No Market	23.000	103.000	16.000	15.800	17.500
18	22.900	24.425	101.000	16.000	15.800	17.500
19	22.825	24.425	101.000	16.000	15.800	17.500
20	22.700	24.425	102.500	16.000	15.800	17.500
21	22.975	24.425	102.750	16.000	15.800	17.500
22	22.900	24.425	103.500	16.000	15.800	17.500
23	No Market	24.425	103.500	16.000	15.800	17.500
25	22.800	24.425	104.000	16.000	15.800	17.500
26	22.500	24.425	104.000	16.000	15.800	17.500
27	22.575	24.425	103.750	16.000	15.800	17.500
28	22.950	24.425	102.500	16.000	15.800	17.500
29	22.575	24.425	102.500	16.000	15.800	17.500
30	No Market	24.425	102.500	16.000	15.800	17.500
AVERAGES FOR MONTH						
Sept.	22.900	24.299	101.250	15.800	15.600	17.100
AVERAGES FOR WEEK						
Sept.						
6	23.488	24.425	97.300	14.800	14.600	15.000
13	22.910	24.425	100.125	15.833	15.633	17.500
20	22.805	23.879	102.250	16.000	15.800	17.500
27	22.710	24.425	103.583	16.000	15.800	17.500
CALENDAR WEEK AVERAGES						
Sept.						
2	22.746	23.425	99.542	14.333	14.133	15.233
9	23.200	24.425	98.000	15.400	15.200	16.500
16	22.850	23.879	102.125	16.000	15.800	17.500
23	22.860	24.425	102.375	16.000	15.800	17.500
30	22.640	24.425	103.208	16.000	15.800	17.500

Silver, Gold and Sterling

DAILY AND AVERAGE PRICES

	Sterling Exchange "Checks"	Silver (c) New York	Silver (c) London	Gold (d) London	Gold (d) United States
Sept., 1950					
1	$280.000	72.750	63.500d.	248s.	$35.00
2	(e)	(e)	(e)	(e)	35.00
4	Holiday	Holiday	63.500d.	248s.	Holiday
5	280.000	72.750	63.500d.	248s.	35.00
6	280.000	72.750	63.500d.	248s.	35.00
7	280.000	72.750	63.500d.	248s.	35.00
8	280.000	72.750	63.500d.	248s.	35.00
9	(e)	(e)	(e)	(e)	35.00
11	280.000	72.750	63.500d.	248s.	35.00
12	280.000	72.750	63.500d.	248s.	35.00
13	280.000	72.750	63.500d.	248s.	35.00
14	280.000	72.750	63.500d.	248s.	35.00
15	280.000	72.750	63.500d.	248s.	35.00
16	(e)	(e)	(e)	(e)	35.00
18	280.000	72.750	63.500d.	248s.	35.00
19	280.000	72.750	63.500d.	248s.	35.00
20	280.000	72.750	63.500d.	248s.	35.00
21	280.000	72.750	63.500d.	248s.	35.00
22	280.000	72.750	63.500d.	248s.	35.00
23	(e)	(e)	(e)	(e)	35.00
25	280.000	72.750	63.500d.	248s.	35.00
26	280.000	72.750	63.500d.	248s.	35.00
27	280.000	72.750	63.500d.	248s.	35.00
28	280.000	72.750	63.500d.	248s.	35.00
29	280.000	72.750	63.500d.	248s.	35.00
30	(e)	(e)	(e)	(e)	35.00
AVERAGES FOR MONTH					
Sept.	280.000	72.750	63.500d.	—	35.00
AVERAGES FOR WEEK					
Sept.					
6	280.000	72.750	—	—	—
13	280.000	72.750	—	—	—
20	280.000	72.750	—	—	—
27	280.000	72.750	—	—	—

Calendar week averages, New York Silver: Sept. 2nd, 72.750; 9th, 72.750; 16th, 72.750; 23rd, 72.750; 30th, 72.750.

(e) No market (Saturday).

THE above quotations for major non-ferrous metals are our appraisal of the important United States markets, based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis. All prices, except gold and silver, are in cents per pound.

(a) Net prices at refineries on Atlantic seaboard. To arrive at the delivered New England basis add 0.300c. per pound, the average differential for delivery charges.

(b) Our export quotation for copper reflects prices obtaining in the open market and is based on sales in the foreign market reduced to the f.o.b. refinery equivalent, Atlantic seaboard. On f.a.s. transactions we deduct 0.075c. for lighterage, etc., to arrive at the f.o.b. refinery quotation.

Copper, lead and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

Quotations for copper are for the ordinary forms of wirebars and ingot bars; cathodes are sold at a discount of 0.125c. to 0.15c. per pound.

Quotations for zinc are for ordinary Prime Western brands. Zinc in New York commands a premium over the St. Louis basis equal to the freight differential. Contract prices for High Grade zinc delivered in the East and Middle West command a premium of 1.10c. per pound over the current market for Prime Western; Special High Grade 1.25c.

Quotations for lead are for common lead. Corroding lead commands a premium of 10 points.

(c) The daily New York silver quotation reported by Handy & Harman is for silver contained in ores and other unrefined silver-bearing materials, in cents and one-eighth cent fractions per troy ounce. It is determined by Handy & Harman on the basis of actual sales of bar silver .999 fine in amounts of 50,000 ounces or more for nearby delivery at New York, and is usually one-quarter cent below the price paid for such bar silver, this deduction being the allowance for carrying, delivering and marketing. In addition to foreign silver, the quotations also apply to domestic and Treasury silver if such silver enters into the New York market.

The Treasury's purchase price of newly mined domestic silver is 90.5c. per troy ounce 1000 fine, effective July 1, 1946. London silver in pence per troy ounce, basis .999 fine.

(d) U. S. Treasury's gold price. Actual payment by the United States Treasury for gold is at 99.75 per cent of the price quoted by the Treasury, which is equal to $34.9125.

Behind the By-Lines...

G. P. Lutjen

» **We obtain our monthly quota** of exasperation thinking up titles for technical articles. Specifications are rigid; it mustn't be (1) too brief for the reader, (2) too long for the page, (3) too dry for the boss, (4) too racy for the author. The tricky article this month was the Quemont story (p. 74). Author **R. J. Dionne** (left) innocently left the decision in our hands, not realizing how rash a step it was. (A while back we were highly pleased with our title, "The Bush and I," for a story on the Canadian backwoods. The author hasn't spoken to us since.)

Quemont impressed us with its well-planned layout and general air of spaciousness, so after an appropriate period of ceiling gazing our first attempt at a title was, "Quemont—No Stoop, No Squat, No Squint." This was unceremoniously vetoed for some obscure reason.

The jitterbug crowd probably influenced the second attempt which was, "Quemont—Plan You Now, Dig You Later." Rather sound philosophy, we thought, but this too got the Jakob Malik treatment.

The final result may be short of exotic, but at least it fills the specifications.

» **If your travels have ever taken you** into the neighborhood of Gilman, Colo., you may have wondered what was under that big cliff. Well, we put the shears to the shroud of secrecy and found out, of all things, that that's where they keep the Eagle mill. Apparently it's like most mills, filled with ball mills, small pieces of rock, and people. One of the people is the mill superintendent, **J. G. Craig,** who does a fine job of describing this bomb-proof plant. To see what it's like when you have to go down in the mine to go to work at the mill, turn to page 80.

» **We doff our hardboiled hat this month** to Foster D. Snell, Inc., chemists and engineers, for their example of thoughtfulness and hospitality. The company maintains a guest office at its New York headquarters to provide their guests with a desk, telephone and stenographic assistance. "Although it is not palatial," they state, "certainly it will meet your needs."

» **No doubt a few readers are mumbling** in their beards about the apparently crummy service they are getting after going to the trouble of sending in the New Products postage-free reply card (see p. 126). We'd like to take this opportunity to mumble right back at them. Last month no fewer than 6 cards came in without a name and address, although each had a half dozen numbers carefully circled. A shift boss of our acquaintance had several well chosen words for situations like this, but if the words were printed we'd get banned in Boston.

» **Hope this isn't too late** to cut you in on the gravy, but the Gravity Research Foundation, New Boston, N. H., is offering 7 cash awards for the best 2,000-word essays on the possibilities of discovering some partial insulator, reflector or absorber of gravity. This ought to be a sitting duck for Buck Rogers fans. First prize is $1,000, which would keep you in cigars, as it were, but the contest closes Oct. 15.

Notice of this essay competition came to our office after some ore dresser had penned the suggestion across the bottom, "Perhaps we should tell them what happens when we try to concentrate fine sulphides on a table."

» **A diverting little story** was brought to mind by last month's article on the necessity of readying our mines now for international squalls to come.

A young husband and wife, expecting their first-born, realized at 3:00 a.m. one morning (as is frequently the case, especially in stories like this), that the youngster's arrival was imminent. The young man frantically telephoned the doctor, who, true to tradition, came as quickly as his 1950 Buick could carry him.

Entering the house, the M.D. issued a brief instruction to the trembling father-to-be to prepare "hot water, lots of hot water," and disappeared with his little bag into the patient's room, closing the door behind.

The husband busied himself boiling water and pacing the floor. After some 3 minutes, the doctor stuck his head out the door. "Got a screwdriver?" he asked in low, clipped tones. With fear and trepidation the husband fetched the screwdriver and the door once more closed behind the doctor.

The father-to-be resumed his pacing and boiling. Four minutes passed and the doctor again stuck his head out the door. "Got a hammer?" he asked in ominous tones. With desperate speed, the young man secured the hammer and passed it over. But before the doctor could shut the door again, the husband grabbed his arm. "Doc, ya gotta tell me," he cried in a voice that bordered on hysteria, "What's happening to my wife?"

"Don't know," said the doctor, "I can't get my bloody bag open."

Frankly, the exact analogy escapes us now, but it was awfully clever when we thought of it last month.

» **Discovery of tritium,** the H-bomb explosive, in water has been announced by the Research Institute of Temple University, and it has completely changed our perspective. You can have the gold, platinum and uranium mines with all the cheap metal in them! It's the tritium business for us with the price in the neighborhood of $31,000,000 per oz. Production requires an atomic reactor, but that's no problem. Our little boy got one of those by sending in two tops off the cereal box. The real drawback is that tritium is a little scarcer than somewhat since there is only one atom of it for every sextillion atoms of hydrogen in ordinary water.

ENGINEERING AND MINING JOURNAL

OCTOBER, 1950

Make Voluntary Allocation Work

THE DEFENSE PRODUCTION Act contains a clause which should spur industrialists to solve their marketing problems on the voluntary cooperative basis which the Act contemplates. It reads: "Whenever a ceiling has been imposed with respect to a particular material or service, the President shall stabilize wages, salaries, and other compensation in the industry or business producing the material or performing the service."

Although many may believe that it is best to have either complete controls or no controls, the prospect of applying straitjackets to single industries has frightening potentialities. Nothing would be more likely to impel workers to move out of affected industries or those likely to be affected, and a manpower drain is one thing mining and smelting cannot afford.

For this compelling reason, we urge the sellers of scarce minerals or metals to do all they can to promote voluntary controls and to make them work, keeping in mind, however, that collusive activity can only be initiated legally by the President or officials with specially delegated authority.

Proposed Method of Computing Depletion Allowances

A UNIQUE and unjustified privilege is accorded to the mineral industry by percentage depletion allowances in the opinion of Douglas Eldridge, writing in the "Journal of Political Economy" for June, 1950. We contest this view, and urge that a properly qualified expert should answer Eldridge in that same journal. Otherwise we are sure that its influential readership will accept his viewpoint, which it in general does anyway.

Eldridge, whose statements no doubt reflect the Treasury attitude quite accurately, believes that the mineral industry should be "treated like all other taxpayers" and enjoy tax-free only recoupment of costs of mineral properties. He believes that prices will react to provide more effective incentives to mineral development than percentage depletion allowances, which he considers inequitable as between different minerals and as between types of deposits, and wasteful as an incentive.

Because many of his arguments are perceptive it is no easy task for a non-expert to answer Eldridge. We agree with his view that prices would rise sooner or later, and must admit that there is truth to his contention that the method is a "shotgun" solution that does not take account of differences between acquisition costs of various minerals and of the variance between costs of discovery of different types of deposits. These inequities have always been justified by the need for a simple solution.

For our part we cannot acknowledge any equity between taxpayers if the concept of depletion against value is abandoned for cost depletion unless the Government is prepared to tax capital gains as heavily as ordinary income. To do the latter seems to us a very strong deterrent to investment, which is fundamental to a successful capitalistic system. Even the socialist government of the United Kingdom avoids taxation of capital gains, whereas under our system they already bear a substantial tax load.

If the principle of a reduced load on capital gains is retained, some equivalent of percentage depletion seems necessary in order to preserve Eldridge's concept of equity between taxpayers. Would the Treasury seek to wipe out the right to deplete against values established at the inception of income taxation (1913)? If not, why penalize the owner of another property just because his value was not established in 1913? Also, the right to apply cost depletion would not prevent a discoverer from selling his property and establishing a capital gain, nor the purchaser from taking depletion allowances against the new cost of acquisition. Why then, discriminate against the owner who elects to deplete rather than sell his property, and thus promote a chaotic transfer of properties every time discovery or development uncovers new values in excess of unrecouped cost?

If the Government were willing to permit the mineral owner to recoup his acquisition costs before becoming taxable and then would treat that portion of operating income attributable to the resources* as a capital gain, then and only then do we believe it would be equitable to eliminate depletion allowances.

We propose this as a solution to the problem or at least as an equitable method of recomputing percentage depletion allowances, but after elimination of the 50% of net income limitation.

*Our concept would be gross income from the property less operating costs and 5% of operating costs to compensate for operating work and worry.

To Solve This Manpower Problem . . .

1. The Armed Forces Are Taking Too Many Miners.

Example: Meat-axe induction of a group of so-called reserves in one Western mining camp will surely cut that area's copper output by 25% or more. The Army's only reply to protests is, "We've got our orders."

2. War Industries and Government Projects Are Luring Miners Away.

Government and war plant recruiters and newspaper advertising in mining districts keep miners aware of opportunities in war-born industries. Hundreds of men have already left the mines, particularly in Western camps.

3. Manpower Shortages Will Again Cut Metal Output.

The manpower supply in mining is by now so delicately balanced that it is certain that the effect of lost manpower will be felt on metal output faster and sharper by far than in 1942.

Here's What Needs To Be Done

1. For the Department of Defense.

Declare skilled miners and key supervisory personnel exempt from call by the draft as long as they work in defense-essential mineral enterprises. Men in reserve status should be deferred as long as possible.

2. For War Industries and Government Projects.

Advertising for men, or recruiting men, in mining districts should be stopped. Government departments should halt all projects not directly connected with defense preparation. Wage scales on defense projects should be in line with area practice.

3. For Mining Management and Labor.

Unions and management must join in working to keep men in the mines. Let unions investigate living costs, housing conditions in cities near war plants, find out if a shift to war work is a really good idea after all. Let management step up worker training and quality of supervision. Let both work to get rid of Reds in labor unions.

Stop The Manpower Muddle Before It's Too Late

LET'S GET THIS clearly in focus. The manpower muddle in mining isn't something that will be merely inconvenient if we get into a war, or that will cause management and bureaucrats a few headaches.

The manpower muddle in mining could lead dangerously close to losing the next war. It could slow the defense effort badly if there's no war. Here's why.

Mining faces emergency demands for minerals with: 1, a manpower shortage already in being; 2, lagging development work; 3, inadequate financing for many mining companies; 4, leaner orebodies; 5, a scarcity of skilled engineers and administrators; 6, crushing tax burdens. The worst potential trouble spot is manpower.

None of these discouragements existed in 1941 when the Japs bombed Pearl Harbor. But just take a quick look at what happened back there.

Although tremendous demands were immediately made on metal mining, no one took thought for the men who actually did the work.[1] Selective Service took about 21% of the nation's miners. Another big group was lured away by fast-talking recruiters for Government projects, war plants, the Armed Forces, or the Merchant Marine. Other hundreds didn't wait to be lured.

After thousands of good miners were gone, official Washington woke with a start to find metal output failing to increase as it should. General Hershey, General Somervell, Donald Nelson, and a whole covey of assorted brigadiers and bureaucrats appealed by letter and by oration to the country's miners to "back up our boys" and get in there (the mines) and fight. It was all sincere, man-to-man stuff, written by some of the best ghost writers in the business. It all fell conspicuously flat.

So in September, 1942, the U. S. Employment Service tried to freeze miners to their jobs, and about 1,000 more miners promptly quit. The USES "certificates of separation" were generally ignored.

Finally, on condition that the gold mines be closed by order, the War Department agreed to release 4,200 soldiers for work in "essential industry." The Army didn't select miners and it didn't channel the men into mining. Even so, these men did help production for a while.

The War Department had to do it again in 1943. The 5,306 soldiers furloughed this time were carefully chosen and sent right to various mines. About half had some underground experience. No one knows how many stuck with mining, but in any case the Army did get a great many of these men back within a year or so.

The worst of it was that at the same time the Army was releasing inexperienced men as "miners," Selective Service went right on drafting real miners for the Army.

The manpower problem was never solved. Employment and metal output (see cover, this issue) declined steadily from 1943 on. The industry was saved by the bell. If the

[1] Data on World War II taken from "The Domestic Mining Industry of the United States in World War II." John Davis Morgan, Jr., published by National Security Resources Board, Washington, D. C., 1949.

war had gone on, the Armed Forces would simply have had to make do with a greatly reduced supply of metals. The men to mine the ore just weren't there.

Are we in any better shape now? Obviously not. As the nation heads into what could easily become World War III, mines in the United States are short of miners. In fact, as we pointed out last month in a survey of the state of the industry, the worst of mining's problems is manpower. Miners now at work must be induced to stay there, or production will drop a lot faster than it did in World War II.

The Military Mind

But the Army doesn't see it that way. For example, down in Arizona, back in 1947, a reserve battalion of engineers was organized. It appeared on the records as the 412th. Engineers Construction Battalion, but there were no officers. It never met, it never trained. Its strength finally dwindled to one enlisted man.

Then early in 1950 someone set about building it up. A campaign in the Globe-Miami-Superior area got a great many young fellows to sign up, most of them probably thinking they'd get some fun out of it, at least.

Well, they probably will. Orders came through in mid-August to activate the battalion, and on Sept. 11 most of these men went into the Army. One company, losing 44 good miners this way, estimates that the loss will cut its copper output 25%.

The Army thinks it is getting a trained engineers' battalion, which it isn't. The mining companies know they are losing irreplaceable trained miners and shift bosses.

We say irreplaceable because there is no use telling mines to replace drafted miners with 4-F's. If there were young men around in good enough physical condition for mining jobs, the Army'd grab them, too. Other industries can fill gaps with women if necessary. The mining industry can't.

With an ever-increasing flood of contracts to war plants, more men are leaving the mines right along. They go to the Puget Sound Navy Yard, the Boeing plant in Seattle, to the airplane plants in Los Angeles, and to many re-born war-industry towns all over the country.

They go partly to try a new kind of life, partly to earn more money, partly because they are afraid of a job, or wage-freeze, order, and partly because they are fed up with mining.

Perhaps this sort of attraction can't be fought directly, but at the very least it should be possible to stop recruiting by Government and war industry agents in the mining districts. It makes no sense at all to build up the staffs of armament plants at the expense of the mines that supply their raw material.

In fact, the mining industry will have to get more men if output is to expand at all. In Utah, for example, 8,000 men now work in metal mines as against 15,000 during World War II.

Where would these 7,000 men come from now? Up in Montana, 1,400 men are needed; Coeur d'Alene mining companies need over 500, and so on. These men are needed, not to expand to wartime scale of output, but just to meet the present demand. These men have been needed, and the need has been advertised for months, but the men have not been found.

What Not to Do

The problem then is how to stop the present drain on mining manpower and how to get more men into mining.

At least we know from experience that there are things that don't work, and there is no need to waste time on them. The manpower shortage in mining was *not* helped by:

1. Emotional letters from big men in Government.
2. Closing the gold mines.
3. Advertising campaigns.
4. Transference of non-miners to mining camps.
5. U. S. Employment Service job certificates.
6. Job-freezing orders.

What Should Be Done

First of all, the Department of Defense, in its own interest and in that of the United States, should declare skilled miners exempt from service with the Armed Forces. Draft boards should be notified to stop drafting skilled miners immediately, and voluntary enlistment of miners should be discouraged.

This should be done at once, and every member of the mining industry should consider it his public duty to see that all possible pressure is brought to bear on Congress and the Department of Defense to see that it is done.

Second, all Government agencies signing contracts for war work should be required to make clear to the contractor that he should avoid certain specified mining districts in recruiting men for war plant work.

Also, all work on non-essential Government projects, at least those near mining districts, ought to be stopped at once. With the tide of inflation rising before the country, it is sheer folly to waste manpower and raw materials on work that is not essential to defense and is inflationary. At the very least, Congress should stop any new such projects.

Also, contracts should specify that wage scales on war projects should be held in line with area practice. It may be the death of many mining companies to have to try to compete for men against the kind of cost-plus wage scales that so upset the industry in the last war. There isn't any justification for the turmoil that occurred after Pearl Harbor. Let's take the time we now have to avoid the mistakes that couldn't be helped then.

Third, management and labor can get together and do something about the manpower problem, if they will. It does a union local no good to lose its membership any more than a high turnover helps management. Butte Miners Local No. 1, for example, lost 1,003 members in the first five months of 1942.

Every effort should be made to get union cooperation in persuading miners to weigh the advantages and disadvantages very carefully before leaving mining jobs.

The manpower problem is serious enough to both management and unions that both ought to be willing to strive for the fullest cooperation in studying at the local level what tempts men to leave. Then each could do all in its power to correct the situation. This is no time for talking for the record and the pulling and hauling so characteristic of bargaining table proceedings.

In any event, there is the job in simple terms. If the Army wants metals and minerals, and it certainly does, let it stop taking miners. If war plants want raw materials, and they certainly will, let them keep away from mining districts when they look for workers. And if management and labor unions want men to work with, it is time for a new era of cooperation in creating local conditions that will induce men to stay in the mines! And work!

INCREASE CAPACITY? It will be easy in this spacious mill. An 1,800-ft. conveyor brings ore from the shaft.

Quemont—Designed Today

Development of a large mine is inherently a matter of painful growth. Plant and equipment are squeezed to the limit to boost production, which often results in crowded, inefficient and unsafe improvisations. Here is one mine that planned big so that an unhampered staff can devote all its time and energy to mining ore.

R. J. DIONNE

Quemont Mining Corporation, Noranda, Quebec

A LOT OF PEOPLE would have given up; as a matter of fact, a lot of them had given up. Certainly the indifferent results of Quemont Mining Corp.'s overall drilling program shaped an outlook as bleak as Canada's cold skies in that February of 1945. But No. 10 hole was next on the program and so No. 10 was put down through the ice on Lake Osisko in western Quebec. And No. 10 hole put Quemont back in business, when drillers reported that it had intersected 141 ft. of massive sulphides carrying good values in gold, silver, copper and zinc.

The report touched off an intensive exploration program which, by March, 1946, had outlined an orebody estimated to contain more than 6,000,000 tons of ore averaging 0.18 oz. gold, 1 oz. silver, 1.58% copper and 3.2% zinc. It was enough to start the Quemont management thinking in terms of mine plant and mill that could handle 2,000 tons a day. Premature decision might well have cost the company dearly in trying to get optimum production from a smaller, hastily constructed plant. Interestingly enough, later drilling in the same zones raised the ore estimate to more than 9,000,000 tons.

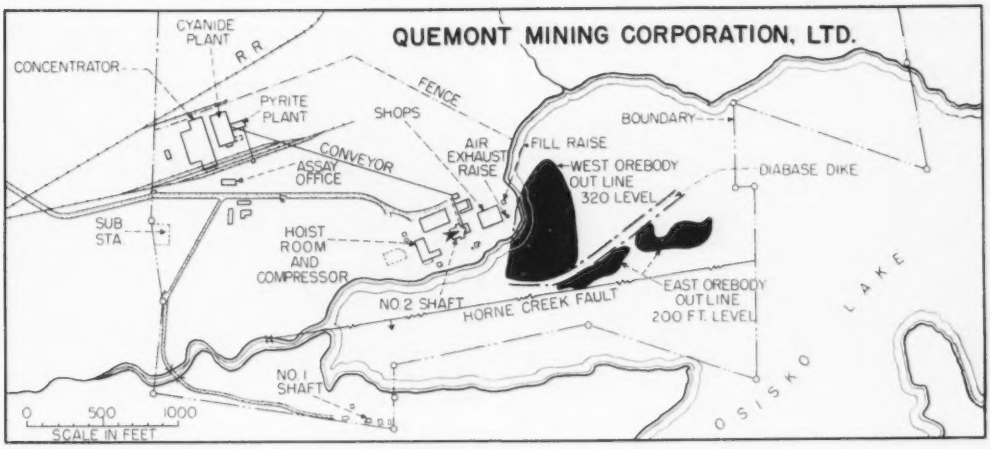
Diamond drillers kept busy during the balance of the winter in 1945, and with the coming of spring, miners set about the rehabilitation of the 19-year old No. 1 shaft up against the Noranda boundary (see map above). They drove from the old workings on the 200 level to the ore zone and drilled a series of vertical holes to outline one orebody. The winter of 1945-46 also found 10 diamond drills putting down holes on 100-ft. grid spacings from the ice on Lake Osisko. The mont engineers a great deal about the nature of their correlated information told Quemont engineers a great deal about the nature of their orebody.

Geology and Structure—Dominant feature of the area is the Horne Creek fault, extending several miles east and west. It crosses the Quemont property near the south boundary where it has a strike of N. 80 deg. E., and dips sharply south. Although the main fault plane is represented by a narrow mud seam less than one inch wide, a zone of crushed rock exists up to 150 ft. in width on the south side. The Noranda orebodies all lie south of this fault, which is why early underground work at Quemont was in this area. That work, however, on the 200, 500 and 900 levels disclosed the rock to be mainly diorite or metadiabase with very little of the favorable rhyolite. To the north of the fault, the rocks are predominantly rhyolitic agglomerate and rhyolitic flows.

In the ore area, the Donalda fault branches from the Horne fault in a northeasterly direction. This fault divides what have been termed the west orebody and the east orebody. The west orebody is currently being mined. Less is known of the east orebody, although further probing is now being pushed and plans for stope preparation are under consderation.

West Orebody—A section (above) of the west orebody shows individual orebodies lying in a domed structure consisting of rhyolitic agglomerates capped by a porphyritic rhyolite flow.

The west flank of the dome plunges 60 to 65 deg. The north flank plunges at an average of 65 deg. from the 320 to the 900 levels. The east flank apparently



ORIGINAL EXPLORATION was done south of Horne Creek Fault, but main orebodies were later found to the north.

for Tomorrow's Production

plunges steeply but details have not yet been ascertained. The south side appears to be truncated by the Horne Creek fault. Maximum ore is located at the top of the dome where it is developed on 200, 320, 440 and 560 levels. An anticlinal fold extends down the west flank of the dome in which sulfide ores have been traced and partially developed to a depth of 2,340 ft. A similar type of fold on the north side shows ore which has been traced and partially developed to a depth of 1,300 ft. How deep the east orebody goes has not yet been determined.

Interbedded with the agglomerates are small porphyritic rhyolite flows which are folded in a similar manner. These appear to act as traps for mineral deposits just as the porphyritic rhyolite cap. Sill-like feldspar porphyry intrusives cut through these formations. They are pre-ore and are slightly folded to roughly conform with the flows and pyroclastics. These also act as traps for the minerals. Other intrusives are rhyolites and diorites, both of which are pre-ore. East-west and north-south diabase dikes cut the orebodies and are at least post-ore-structure if not post-ore.

Individual orebodies are massive in character. Main minerals are pyrite and pyrrhotite, through which chalcopyrite and sphalerite are disseminated. Pyrite and chalcopyrite are also found in several chloritized zones. The distribution of fold follows no set pattern. Good gold values are generally, but not necessarily, found with good chalcopyrite. Gold values are also associated with the occasional findings of magnetite.

Mining Methods—Mining of this ore was never done on a piecemeal basis and that is the crux of the Quemont story. A plant was laid out to produce 2,000 tons without a strain, with lots of room for expansion should it be desirable later on. Modern equipment, functional design and more than adequate space are the characteristics of the Quemont plant. The mine staff has not had to contend with the growing pains of trying to handle 1,000 tons of rock with a 400-ton plant and then stacking improvisation on top of improvisation to get 500 tons more.

To mine the west orebody, Quemont collared its No. 2 shaft in 1946 in a convenient outcrop just west of the west orebody, and raised the shaft from the 200 level. The shaft was sunk to the 1,080 level by September, 1947, and completed to the 2,520 in August, 1949. Production started June 20, 1949.

Study of the characteristics of the orebody determined two main methods of mining. First are the cut and fill stopes, to both pillar walls and assay walls. In several locations a sublevel stoping method is also used.

Normally, cut and fill stopes are 30 ft. wide with 20-ft. pillars. In a typical development, miners drive

Quemont Timetable

1920...The Murray brothers of Haileybury stake their claims on the north boundary of Ed Horne's discovery (1920) of what was to be Noranda Mines.

1926...United Verde Extension Company of Arizona takes up the option. Completes 6,000 ft. of drilling.

1928...Mining Corp. of Canada acquires a 90% interest in the property and forms what later becomes the Quemont Mining Corp. Operations suspended in 1930.

1943...Donalda, Quemont's neighbor to the east, hits some high-grade ore. The discovery sparks an exploration rush in the district.

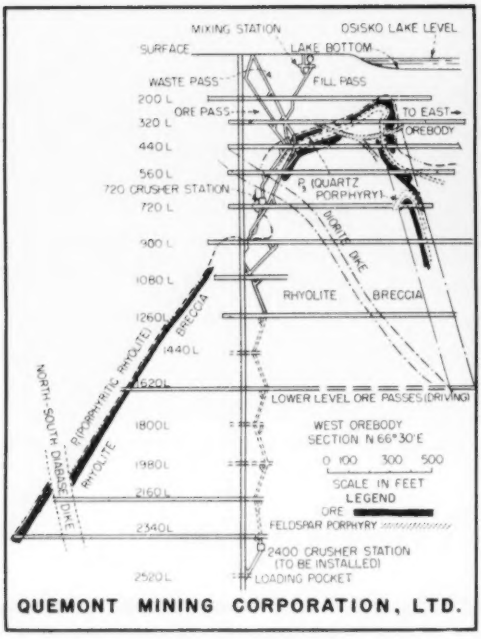
1944...Magnetometer survey covering both land and lake areas on the south portion of the Quemont property indicates some 10 anomalies. Summer-time drilling probes these sections without success.

1945...No. 10 hole is put down through the ice on Lake Osisko. Drillers report intersection of 141 ft. of massive sulphides.

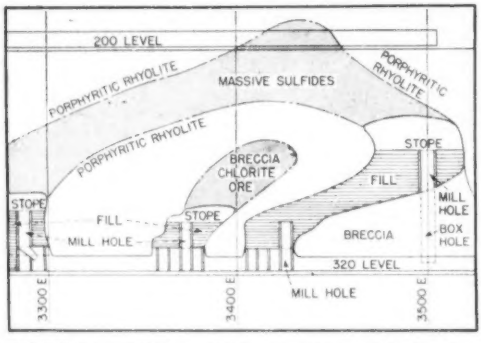
1946...Quemont collars No. 2 shaft.

1947...Shaft reaches 1,080 level in September.

1949...Production starts June 20.



SHARPLY DIPPING West orebody is being mined on its upper levels and is partially developed to the 2340.



FOLDING complicates mining operations, calls for close control by supervisors. (See right, above.)

through the orebody on 50-ft. centers. To do this job jumbos are used almost exclusively with five of them currently in operation at the mine. The next step is to sill out on the level, slashing to the pillar walls. The back is then taken down to a height of 20 ft. or two stoper lifts. The haulage drift is timbered as well as a gangway alongside the haulage drift, using 10-in. posts and 12x12-in. caps. These passageways are each approximately 7½ ft. wide, leaving about 3½-4 ft. alongside the gangway to the pillar wall. After timbering, a raise is driven at one end of the stope, although sometimes the raise is driven before silling out.

Sufficient fill, consisting of granulated slag from the Noranda smelter, mixed with pyrrhotite tailings at the mixing station (see diagrammatic section) near the surface, is scraped in to fill space between pillar

ASSAY-WALL STOPES have highly irregular contours. Supervisors mark out the wall daily so that miners can follow the orebody. The back is arched for better support.

wall and haulageway and over the haulageway to a height of about 13 or 14 ft. above the rails. Within a year, this fill will become consolidated by the oxidation of the pyrrhotite, simulating a weak, porous concrete. This is covered by 3x8-in. planking. Finally, from the raise, a slot 8 to 10 ft. higher than the back, is cut across the width of the stope. The stope is then ready for mining.

A round of 18 to 24 holes is drilled into the breast, maximum depth of hole being 13 ft. Eleven of these holes are used to cut an arch in the roof, which is 3 ft. higher in the center than at the ends. This arch gives the back better support. Vertical holes were once tried but horizontal holes have been found more efficient in getting better breakage per pound of powder. After blasting the first round, enough muck is scraped to a mill hole near the raise to clear the way for drilling the next round. The breast is carried the full length of the stope before the stope is completely mucked out.

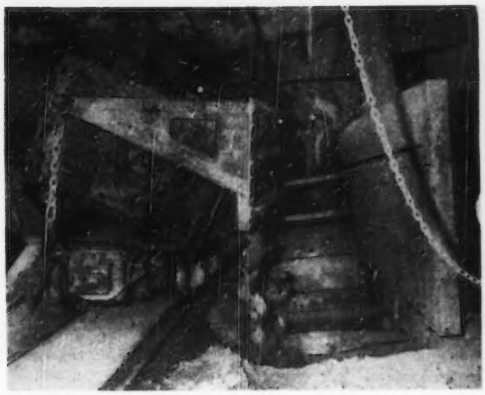
After mucking out, the plank floor is lifted (with about 10% timber loss) and fill is put in to raise the floor to a convenient height for making the next cut. The fill is distributed by a V-shaped, box-type scraper. Throughout operations, surveyors give grade line for breasts and marks for fill.

Scraper hoists powered by 30-hp. electric motors and hoe-type scrapers pull ore into timber-cribbed passes from which it is loaded into 60-cu. ft. cars through air operated arc gate chutes. It is then trammed to the ore pass.

Cut and fill assay-wall stopes are mined in much the same fashion. However, they vary considerably in width within the stope as the walls are determined by daily assay with supervisors continually marking out the walls.

Sublevel stopes are 60 ft. wide and vary in length from 100 to 200 ft. The entire area is undercut for full width and draw points, belled out on 30-ft. centers, feed a scram drift. The grade of the scram drift ranges from 0 to 10 deg. A 60-hp. scraper hoist is used here to pull a 48-in. folding scraper.

Miners cut a slot at one end of the stope and mining retreats from the slot along the stope. Both vertical ring drilling and benching systems have been tried out for retreating. Vertical rings put in by diamond drills are preferred since several rounds can be put in



SPRING-MOUNTED, 60-cu.ft., Granby-type cars have proved very satisfactory. Springs take up shock during chute loading, keeping wear and maintenance to minimum.

DIAMOND DRILLERS put in a horizontal ring here, although vertical rings are generally used in Quemont's sublevel stoping. Holes are as long as 75 ft. across the stope.

well in advance of actual mining and slices blasted as needed. Although better footage is achieved in drilling benches, mucking the benches is awkward.

All told, the operation calls for the use of eighteen 30-hp. and two 60-hp. scraper-hoists. There are also 21 mucking machines in service. These are used mainly in development but have been used in stopes and at temporary draw points.

Haulage requires 4-ton battery locomotives with 60-cu.ft. Granby-type cars. The system of ore passes is shown in the diagrammatic section above. A 48x36-in. jaw crusher is located on the 720 level and ore is hoisted from a loading pocket on the 900. A second underground crusher station is proposed just below the 2,340 level. Secondary crushing is done at the surface by two 4¼-ft. standard Symons cones, after screening by two 3x8-ft. screens.

Steel skips have a 75-cu.ft. capacity. The skip hoist is powered by a 600-hp. motor, capable of raising ore at a speed of 1,050 ft. per min. With an eye on the future, this 10-ft. diameter double drum hoist was designed so that the addition of a second 600-hp. motor would raise hoisting speed to 1,700. The cage hoist is powered by a 700-hp. d.c. motor, controlled by a Westinghouse Roto-trol unit. Full speed is 1,500 ft. per min., but the hoist presently operates at 1,000 fpm. Both cage and skip have pneumatic guide rollers.

Water is handled by centrifugal pumps at the 1,080 and 2,160 levels. These pumps are capable of delivering 300 gpm. against a 1,125-ft. head. Smaller centrifugal pump lifts water from the 2,500 level to the 2,160.

Two 3,300-cfm. and one 2,000-cfm. Canadian Ingersoll-Rand angle compound compressors supply air.

Adequacy of Quemont's ventilation system is best illustrated perhaps by a recent visitor to the mine, a non-mining man who remarked, "You have a nice mine here, but isn't it a little drafty?"

True, the 75-hp. fan pushing 150,000 cfm. air through the present workings sets up a draft right now, but same fan will provide sufficient ventilation for several years of expanding underground operations.

Blasting in the stopes is all done electrically, using milli-second and sure-shot delays. Cut fuses are used for development with primacord to prevent misfires.

Surface Plant—As elsewhere at Quemont, the surface plant reflects thorough planning. The mine dry in the main office building, for instance, allots more than average space to each man. Heating and ventilation there are excellent. Modern showers and washrooms would do credit to an up-to-date university gymnasium. A further important feature at a site where the temperature sometimes reaches 40 deg. below zero, is the fact that from the time the men come in to change their clothes until the time they reach their stations underground, they do not have to go outdoors. After passing time clocks and lamp house, the miners going on shift go down a ramp and through a passage to the lower deck at the shaft, just below the surface of the ground. Here are located the shifters' offices and a warm place to wait for the cage. In the main building, along with the dry and various offices, there is a good sized meeting room where supervisors can get together for safety meetings and chalk-talks.

Since the mine is located in an easily accessible area, self-sufficiency as far as the fabrication of parts and equipment is concerned is not necessary. However, shops are set up with an adequate number of modern machines to handle routine repair and maintenance jobs. Office workers, too, are equipped with the modern business machines to simplify their jobs and promote efficiency.

The Mill—Quemont's mill produces a monthly average of 1,200 tons of 51.5% zinc concentrate, which is shipped to the U. S.; 4,700 tons of 20% copper concentrate averaging 1.9 oz. gold and 7.0 oz. silver per ton, which goes to the Noranda smelter next door; 9,300 tons of pyrite concentrate containing 48% sulphur which is sold to a chemical company; and 10,000 oz. of gold and 35,000 oz. of silver.

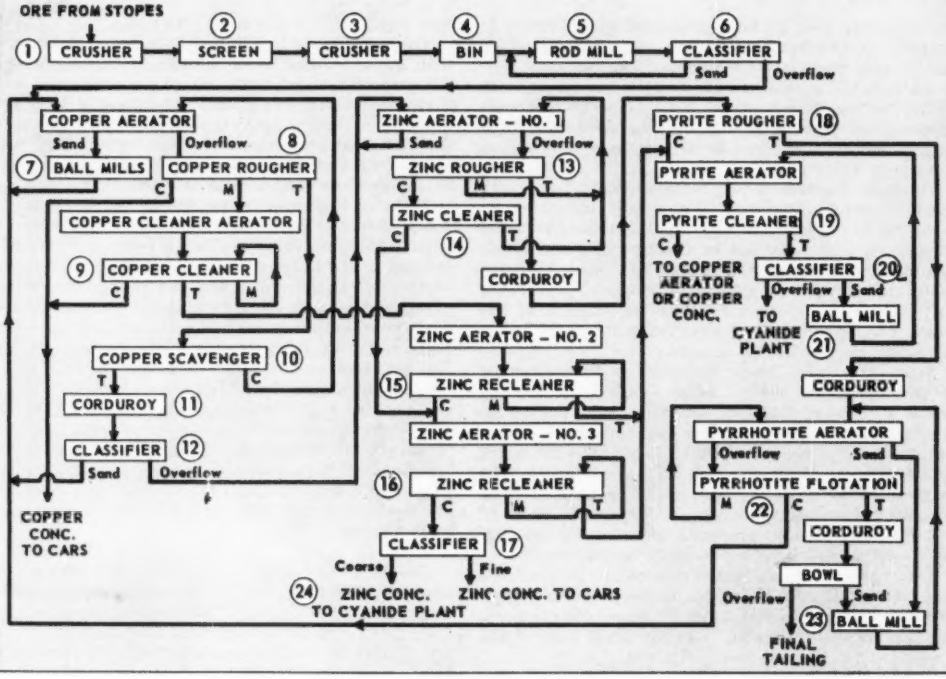
Mill buildings are of steel frame construction and sheeted with aluminum siding over 1½ in. of insulation. Located on the only other convenient outcrop near the headframe, they are about 1,800 ft. from the headframe. Ore is transferred from the secondary crusher at the shaft to the mill on a 30-in. rubber conveyor belt, completely enclosed by 8-ft. diameter steel tubing. The conveyor feeds the ore to either of two 1,760-ton bins in the upper story of the mill. These bins feed ore into the mill circuit as shown in the flowsheet (p. 78).

A standard counter-current cyanidation plant at

PLENTY OF ROOM for current operation and future expansion if necessary. Conveniences include 8,000 lb. elevator, 1-ton lift truck, Draco system.

D. E. BOURKE, mill supt., uses rubber pipe extensively in the mill.

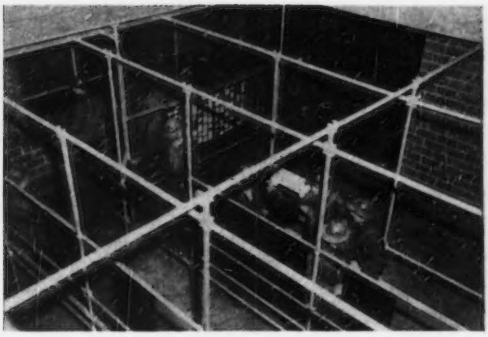
FLOTATION PLANT - QUEMONT MINING CORPORATION, LTD.



LEGEND

1. Canadian Allis-Chalmers 48x36-in. jaw crusher on 720 level of mine.
2. Two Symons screens, 3x8-ft., on surface.
3. Two Symons cone crushers, 4½-ft. standard.
4. Two storage bins, each 1,760 tons capacity.
5. Rod mill, 9 ft. 6 in. x 12 ft.
6. Akins classifier, 54-in.
7. Two 9x12-ft. ball mills.
8. Denver No. 24 copper roughers. Four lines, four cells each.
9. Denver No. 21 copper cleaner, one line, eleven cells, conc. off first four.
10. MacIntosh pneumatic cells, two lines, two cells each.
11. Corduroy blanket launders used where indicated.
12. Akins duplex classifier, 36-in.
13. MacIntosh cells, three lines, four cells each.
14. Two MacIntosh cells of rougher bank used as first zinc cleaner.
15. Denver No. 21 zinc recleaners, two lines, eleven cells each.
16. Denver No. 21, one line, eleven cells.
17. Dorr classifier, 4x20-ft.
18. MacIntosh cells, three lines, four cells each.
19. Denver No. 21, four lines, eight cells each.
20. Dorr bowl classifier, 9x21-ft.
21. Ball mill, 9x12-ft.
22. MacIntosh cells, two lines, three cells each.
23. Ball mill, 9x12-ft.
24. Cyanidation in standard counter-current decantation plant.

TRANSFORMER STATION on each level converts 2,200-v. current to 550 v. for use of scraper hoists in stopes.

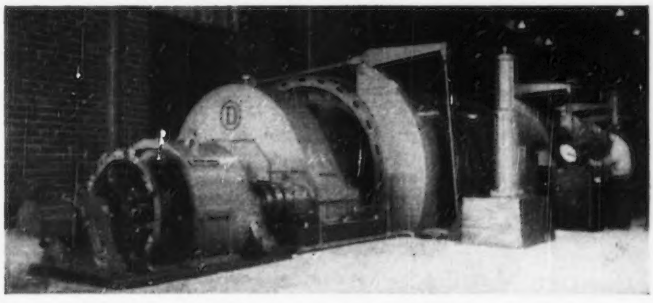


MINERS punch in after changing clothes, pick up lamps, in the main building, walk through tunnel to shaft.

ABOUT 23,000 DETERMINATIONS are made each month in the assay office by 12-man staff under R. L. Gatehouse.

ENGINEERING OFFICE, too, has lots of elbow room, modern lighting and up-to-date equipment.

MODERN BUSINESS MACHINES raise office efficiency, simplify routine.



SKIP HOIST, 10 ft. in diameter, hoists ore at 1,050 fpm. with 600-hp. motor. Easily added second 600-hp. motor would raise speed to 1,700 fpm.

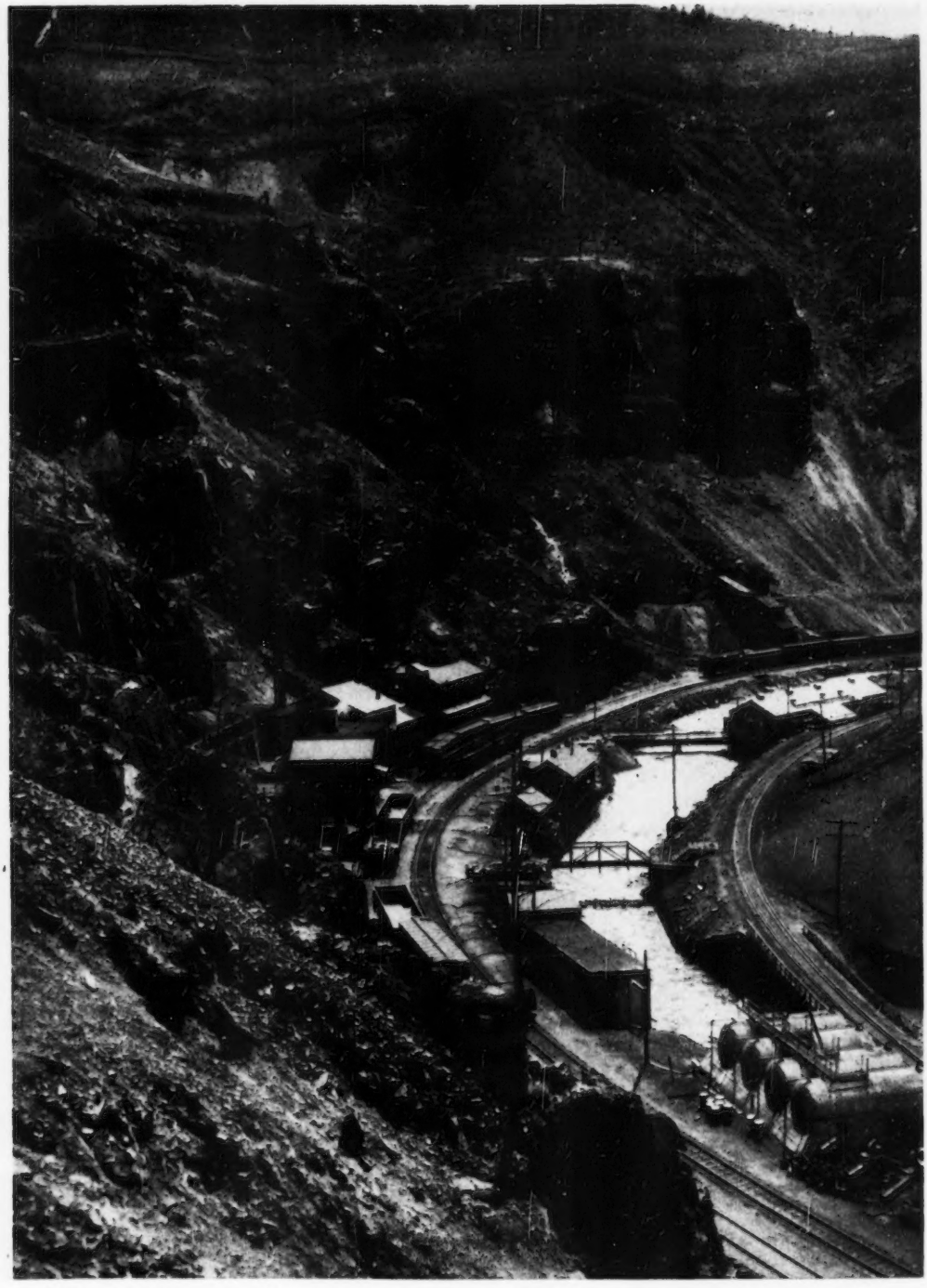
the mill extracts gold from the pyrite concentrate.

The fourth floor of the mill is used mainly for storage of chemicals and supplies, with plenty of room for maneuvering. Half the floor is built to carry a live load of 300 lb. per sq. ft., the other half for 150 lb. per sq. ft. Much of the extra space below is readily available for additional equipment to increase the mill capacity without crowding.

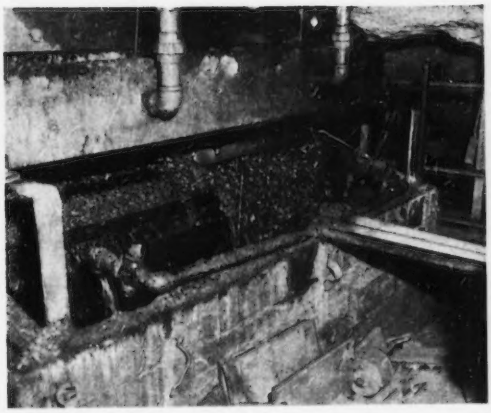
Materials handling is no problem for workmen in the mill. They use a one-ton lift truck and an 8,000-lb. elevator to handle supplies, from the railroad siding at the mill to storage on the fourth floor, and from there to the point of use. In handling bulk lime they use a Draco system, which quickly empties a carload of lime and conveys it pneumatically to any of 3 storage bins suitably located for feeding the various circuits, with a minimum of dust loss. All concentrates are mechanically loaded into railroad cars.

While few mines are in a position to start operations at an efficient mining rate and still make provision for future expansion, experience at Quemont indicates that such a position makes a good target. Because of careful planning, any future demands for increased tonnage will find Quemont ready and able to produce.

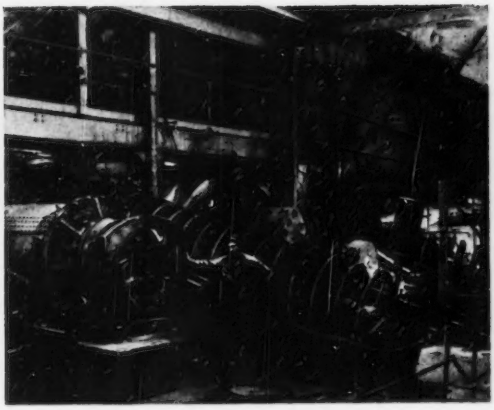
The Mill Inside the Mountain



ATOMIC ATTACK never worries millmen at Empire Zinc's Eagle mill. The whole plant is inside this granite cliff, with only filter, drier, and loading sheds visible. This is main line of D. & R. G. W. RR., along Eagle River, from Salida west. Gilman is on cliff-top behind camera. Compressors for mine and mill are across river at right.



SOLUBLE SALTS, troublesome in flotation, are washed out in this Dorr double-deck rake classifier. Slime product gets separate treatment. Note close clearance between classifier and rock "roof" of mill. It took close planning to get all new equipment into available mill space.



TWO-STAGE GRINDING proved advantageous. Marcy rod mills crush to minus 10-mesh; Eimco ball mills grind to minus 48-mesh with Akins classifiers. Result is potential increase of 67% in grinding capacity and substantial reductions in consumption of grinding media and liners.

Modernizing New Jersey Zinc's Eagle Mill—PART I

Improvement program includes rod mill crushing, soluble salt removal, new equipment installation, revised flowsheet, automatic controls.

J. G. CRAIG
Gilman, Colo.*

*Mill superintendent, Empire Zinc Division, New Jersey Zinc Co., Gilman, Colo.

This is the first of two parts of Mr. Craig's article. The second part, dealing with flotation of lead and zinc in the Eagle mill, will appear next month.

AS A RESULT of certain changes in equipment and in operating procedures, considerable improvement in results has been obtained in recent months in the Eagle mill of Empire Zinc Division, New Jersey Zinc Co., Belden, Colo. These changes, and their effects, are described in this article.

The mill is located underground in the canyon of the Eagle River at a point about 25 miles north of Leadville. The town of Gilman is located on the cliff-top above the mill. The portal of the mill tunnel borders on the westbound track of the Denver & Rio Grande Western Railroad, running from Salida to Glenwood Springs, Colo.

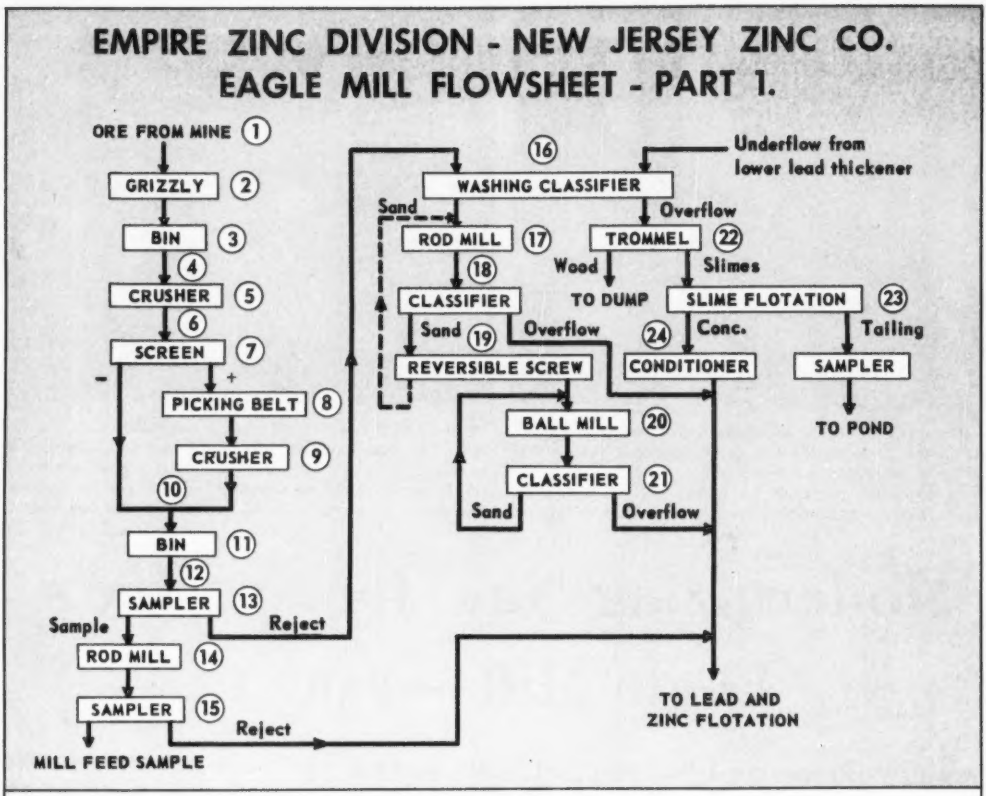
Built in 1928, the mill had to be located underground because of the high relief in the area. No other suitable site could be found.[1] The mill excavation is in granite, the main room being 330 ft. long, 52 ft. wide, and 22 to 56 ft. high. A service incline on an 18-deg. slope takes up a 10-ft. width on the west side. This incline runs from the Newhouse Tunnel (main mine haulage level) at the top of the mill to the railroad loading dock. Vertical distance between these two levels is 116 ft.

In the mill area are also: two underground shops, two mill storage rooms, one mine storage room, a reagent storage and mixing room, a crusher room, a blower room, an auxiliary drier room, a mine service incline, a zinc-lead crude ore storage pocket, three copper-silver ore storage pockets, and a copper-silver ore loading tunnel.

How Ore Occurs

The Gilman, or Battle Mountain district, is on the northeast flank of the Sawatch Range in the west central part of Colorado. Rich oxidized silver and base metal ores

[1]See *Engineering & Mining Journal*, Vol. 132, No. 6, Sept. 28, 1931.



LEGEND

1. Ore trammed through Newhouse Tunnel from mine in 24-cu. ft. rocker-bottom cars. Dumping section and entire mill, underground.
2. Grizzly, 12-in.
3. Storage pocket, 2,400-ton.
4. Ross feeder to 36-in. belt conveyor to crusher.
5. Buchanan jaw crusher, 24x42-in., 3-in. discharge.
6. Two 30-in. conveyor belts, 20-in. Ohio magnet, and 18x32-in. Dings magnetic pulley.
7. Tyler Tyrock screen, 4x8-ft., ½-in. opening.
8. Picking belt, 30-in. to remove wood.
9. Symons standard cone crusher, 4-ft., 3/8 to ½-in. discharge.
10. Belt conveyors, 24-in., and bucket elevator to bin.
11. Steel storage bin, 450-ton.
12. Two 18-in. apron feeders, one 24-in. belt feeder. These join to feed 18-in. belt conveyor equipped with Weightometer and Rateograph.
13. Chain and bucket sampler, 100:1 ratio.
14. Marcy rod mill, 2x4-ft., crushes to minus 20-mesh.
15. Geary-Jennings sampler.
16. Dorr double-deck rake classifier used for washing out soluble salts in ore.
17. Two 4x10-ft. open-end Marcy rod mills, minus 10-mesh discharge.
18. Two 54-in. Akins classifiers.
19. Reversible screw conveyors permit return of sands to rod mills or delivery to ball mills.
20. Two 6x6-ft. Eimco ball mills.
21. Two 54-in. Akins classifiers.
22. Trommel screen to remove wood chips.
23. Eight No. 36 Agitair flotation cells, no pH regulator; Aeroflot 25 and pine oil added. All sulphides float.
24. Two Denver 5x5-ft. conditioners; lime and NaCN added; 30-min. treatment to depress zinc and iron.

and gold ore were discovered during the latter part of the Nineteenth Century by the overflow of prospectors from the Leadville area. Production has been almost continuous since then.

The geologic formations in the area consist of a thick series of Paleozoic sedimentary strata resting on a basement of pre-Cambrian granite and metamorphic rocks. The sedimentary formations range in age from Cambrian to Pennsylvanian. A sill of Tertiary quartz latite porphyry has been intruded a few feet above the contact between the Mississippian and Pennsylvanian strata.

The sedimentary rocks strike northwesterly and have a rather uniform dip of 10 to 12 deg. to the northeast away from the Sawatch uplift. The main structural features are zones of small, discontinuous, high angle faults; bedding plane faults; and small, relatively sharp folded structures. The exact structural control of the orebodies is not well defined.

The ore deposits of the Gilman district consist of fissure veins in the pre-Cambrian rocks and the Cambrian Sawatch quartzite, and replacement deposits in quartzite and in the Devonian Chaffee formation and Mississippian Leadville limestone. The fissure veins contain pyritic gold and complex sulphide ores. They are small and of only

minor importance at the present time.

The replacement bodies in the quartzite consist mainly of pyritic gold-silver-copper ore, although some small bodies of zinc and lead sulphides have been found. The greatest production from these orebodies came from oxidized portions near the surface.

The most important orebodies are replacement deposits in the carbonate rocks. They consist of long, relatively narrow mantos of zinc ore in the upper portion of the Leadville limestone, and funnel-shaped chimneys of copper-silver ore that cut across the strata of the Leadville limestone and the Chaffee formation.

Mineralization is continuous from the chimneys into the mantos, but there is a marked difference in the mineralogy of the two types of bodies. The principal minerals found in the chimneys are pyrite, chalcopyrite, tetrahedrite, freibergite, and occasional galena. The commercial mineralization in the chimneys is erratic and considerable portions consist of almost barren pyrite. The chimneys are surrounded by thin but more or less continuous shells of zinc ore, manganosiderite and sanded dolomite.

The manto orebodies are largely zinc ore although some of them contain a core of barren pyrite near the lower end. The mantos are surrounded by shells of manganosiderite and sanded dolomite.

The most abundant minerals found in the mantos are the marmatite variety of sphalerite, pyrite, manganosiderite and galena. The average marmatite contains approximately 54% zinc and 11% iron, and some of it may carry fractional percentages of lead and copper. The latter two metals occur as microscopic inclusions of galena and chalcopyrite.

The ores oxidize rapidly on exposure to the mine atmosphere and thin films of the oxidation products coat the individual grains and penetrate into minute fractures. Soluble salts—mostly the sulphates of zinc, magnesium, copper, and iron—develop rapidly after the orebodies have been opened up by mining.

General Milling Procedure

The mining department endeavors to mine selectively the lead-zinc ore and the copper-silver ore. The crude copper-silver ore is shipped direct to a custom smelter, while the lead-zinc ore is concentrated in the Eagle mill. The crude zinc ore, delivered from the mine at 12-in. maximum size, is reduced in two stages of crushing to ½ in. This ½-in. product is weighed, washed and sent to the grinding section where it is further reduced in size to approximately minus 65 mesh in two stages of grinding. Through properly controlled conditions the galena is separated by flotation from the balance of the pulp and cleaned in three stages to a final lead concentrate. This lead concentrate is thickened, filtered and shipped to the A. S. & R. Smelter in Leadville, Colo.

The zinc in the lead tails is reactivated and floated from the gangue, then cleaned in two stages to a final zinc concentrate, which is thickened, filtered, dried and shipped to Canon City, Colo., for roasting and sintering and then sent to the New Jersey Zinc Co. smelter at Depue, Ill.

The main separation of high iron marmatite from the gangue, which is mostly pyrite, is somewhat troublesome at times. Pulp temperature, pH reagent additions, and cell manipulation must be closely controlled, for the two minerals tend to react in a similar manner when subjected to the flotation process. The Gilman mill results are noteworthy because of this difficult separation, although results might appear inferior when compared to many sphalerite-nonsulphide gangue separations.

The tailings from zinc rougher flotation go to a tailings pond located about three miles down the Eagle River valley from the mill. The zinc middling product (first zinc cleaner tails) is treated separately in a regrind-re-treatment section making a final concentrate and tailing in this circuit.

Crushing and Storage

The flowsheet shows the equipment and technique of crushing and grinding, but there are several points on which additional explanation might well be given.

An operator is stationed at the Ross feeder under the 2,400-ton coarse ore pocket. He regulates the flow of ore at this point and also picks off trash wood. About ten 20-cu.ft. carloads of wood are picked off here per 1,000 tons of ore crushed, and quite a number of usable wooden wedges salvaged and sent back to the mine.

Although the jaw crusher is set for a reduction of from 12-in. to 3-in. in size, it has very little to do. Only about 10% of the mine ore is

Table I. Primary slimes from washing classifier run about 12% zinc and have this size analysis.

Size	% Indiv. Retained	% Cumul. Retained
+100 Mesh	0.8	0.8
+150 Mesh	4.0	4.8
+200 Mesh	11.3	16.1
+270 Mesh	14.2	30.3
—270 Mesh	69.7	100.0

Table II. Typical screen analysis of various grinding circuit products.

Size	% Indiv. Retained	% Cumul. Retained
ROD MILL FEED		
+.525"	3.12	3.12
+.371"	6.87	9.99
+ 4 Mesh	17.89	27.88
+ 6 Mesh	6.79	34.67
+ 8 Mesh	7.64	42.31
+ 10 Mesh	7.18	49.49
+ 14 Mesh	7.39	56.88
+ 20 Mesh	9.41	66.29
+ 35 Mesh	13.60	79.89
+ 48 Mesh	6.56	86.45
+ 65 Mesh	4.81	91.26
— 65 Mesh	8.74	100.00
ROD MILL DISCHARGE (BALL MILL FEED)		
+ 14 Mesh	0.12	0.12
+ 20 Mesh	0.66	0.78
+ 28 Mesh	3.00	3.78
+ 35 Mesh	7.66	11.44
+ 48 Mesh	14.42	25.86
+ 65 Mesh	15.08	40.94
+100 Mesh	11.00	51.94
ROD MILL DISCHARGE (BALL MILL FEED)		
+150 Mesh	11.42	63.36
+200 Mesh	8.92	72.28
+270 Mesh	4.25	76.53
—270 Mesh	23.47	100.00
BALL MILL DISCHARGE		
+ 28 Mesh	0.17	0.17
+ 35 Mesh	0.83	1.00
+ 48 Mesh	4.83	5.83
+ 65 Mesh	11.83	17.66
+100 Mesh	19.25	36.91
+150 Mesh	19.83	56.74
+200 Mesh	15.17	71.91
—200 Mesh	28.09	100.00
ROD MILL CLASSIFIER OVERFLOW		
+ 48 Mesh	0.50	0.50
+ 65 Mesh	1.83	2.33
+100 Mesh	3.83	6.16
+150 Mesh	7.83	13.99
+200 Mesh	12.33	26.32
—200 Mesh	73.68	100.00
BALL MILL CLASSIFIER OVERFLOW		
+ 48 Mesh	0.58	0.58
+ 65 Mesh	2.60	3.18
+100 Mesh	7.16	10.34
+150 Mesh	14.67	25.01
+200 Mesh	16.67	41.68
—200 Mesh	58.32	100.00

plus 3-in. and goes to the crusher.

Tramp iron is picked up by the magnet and the magnetic pulley ahead of the Symons, although there have been times when a hammer head or drill bit got past them. Several times tramp steel has had to be cut out of the Symons with a torch.

The manganese steel bowl liner on the Symons lasts about 580,000 tons through the crushing department. Only a portion of this ore (about 50%) actually passes through the Symons. The manganese steel mantle lasts about 500,000 tons.

Maximum tonnage through the crushing department is about 130 T/hr. with ideal ore. If the ore becomes wet (above 2% moisture), or if a high percentage of coarse ore is present, this rate is reduced materially.

The crusher runs on a two-shift basis only and under normal conditions a 24-hr. flotation run can be crushed in 10 to 12 hr. The remaining four to six hours are spent by the operator on clean-up and wood removal.

Feeding and Weighing

Crushed ore is drawn from the 450-ton storage tank at a predetermined, adjustable rate (at the present time about 47 T/hr.) through three ore feeders at the bottom of the tank. These feeders, one 24-in. wide belt feeder and two 18-in. wide apron feeders, run at a constant speed, but the amount of ore fed is regulated by an adjustable gate which allows only a given volume of ore to pass from the tank hoppers through the feeders. The operator is required to adjust these gates from time to time, for this type of volume feeding is subjected to changes in weight due to size of ore and specific gravity differences.

These three feeders join to feed an 18-in. wide, inclined belt conveyor equipped with a Merrick Weightometer. The operator is guided by the Weightometer in making adjustments on the feeders. In conjunction with the Weightometer is a recording Rateograph which indicates the rate of feed at any given instant and records the feed rate over any period of time. This is helpful in maintaining uniformity of feed weight to the grinding mills.

The weighing machine is checked once a month with a test chain. Normally it requires little or no adjustment and for periods of a number of months it will check within ½% error. Ore and grease spillage is cleaned from the weighing idlers periodically by the operators to aid in keeping the machine in balance.

At the end of the inclined conveyor belt the ore is sampled by a chain and bucket type feed sampler. The buckets, diamond shaped to prevent filling up and spilling over, have a 1¼x12-in. opening and pass through the ore stream once every 30 sec. This sample, collected at 1 to 100 ratio, is fed to a 2x4-ft. Marcy open-end rod mill which reduces the coarse ore to minus 20-mesh in one pass, then it is sampled again with a Geary Jennings sampler for the final mill feed sample.

Washing and Slime Sections

After passing through the feed sampler, the ore drops into a Dorr double deck rake classifier which is serving as an ore washer. The ore, as it is mined, is acidic because of the occurrence of numerous water soluble salts such as $ZnSo_4$, $FeSO_4$, $MnSO_4$, $CuSO_4$ and $MgSO_4$. These acidic soluble sulfates have proved troublesome in the flotation circuits in the mill. Widely variable quantities are present in the feed (6 to 60 lb./T.) and the individual salts vary to a marked extent within the total. Some of these salts are actually being used in some flotation mills as reagents, and as such, the quantities added to the circuit are closely controlled.

The purpose in washing the ore in the Dorr classifier is two-fold: (1) To minimize the effect during subsequent flotation of varying amounts of salts by washing out a major portion of them. (2) To wash out most of the acidic salts which would consume an excess of alkali further on in the circuit where higher pH is required. The salt removal efficiency of the washing classifier is about 75% (i.e., 25% of the salts in the mill feed carry through the classifier into the grinding section). One additional benefit realized by washing is that trash wood, missed by the crusher operators, is removed by passing the slime pulp over a revolving trommel screen.

The washing classifier makes two products; the coarse washed ore which is sent to the grinding section, and a slime product containing primary fines, water and water soluble salts. This slime product generally is very acidic (pH 4 to 6) and contains enough fines, which assay about the same as the mill feed, so that it cannot be discarded.

Handling this product posed a problem. In the early days of operation these slimes were washed again in a 30-ft. diameter thickener tank and then thickened. The thickened product, containing a minor amount of salts, joined the main flotation circuit for further treatment. The overflow, containing most of the water and salts in solution, was sent to tails. However, this scheme was only partially successful because much of the fine primary mine-activated zinc mineral floated in the lead circuit, contaminating the lead concentrates, and some loss was realized due to fine mineral overflowing the thickener tanks, which had insufficient capacity to make the classification.

It was later discovered that a recovery could be made by bulk floating the lead and the zinc mineral from the slimes in a natural pH circuit (acidic circuit). This is the method by which the slimes are now being handled.

Slime Flotation

Pulp from the slime end of the washing classifier, containing about 10% of the total weight of the mill feed, is sent over a revolving trommel screen to remove wood chips and from there to eight No. 36 Agitair flotation machines in series. No attempt is made to regulate alkalinity in this circuit; the flota is made in a natural pH which at times is as low as 4. A small amount of collector (Aerofloat 25) is added, as well as some pine oil for frother if necessary. No activator for marmatite or galena is used, nor is any depressant for pyrite added.

With 12% zinc in the feed to the slime section a recovery of 90% can be made with about 30% zinc in the concentrates. Approximately 6% more of the soluble salts in the feed are returned to the main circuit via the slime concentrates. The tails from the eight Agitair cells are sent to the final tailings sampler and from there to the tailings pond. The froth is conditioned for about 30 minutes with lime and sodium cyanide in two 5x5-ft. Denver conditioners to depress zinc and iron minerals in the lead flotation section. From the conditioners the slime concentrate joins the main circuit at No. 1 lead rougher cell feed box.

The retention time in the slime cells is about 10 min. and the pulp contains about 18% solids. The cell boxes are of wood construction and the impellers and diffusers are rubber covered to combat the effect of

the acid pulp. Table I shows a typical screen analysis of the slime feed.

The coarse washed ore product from the washing classifier is split to two 4x10-ft. open-end Marcy rod mills for coarse grinding. These rod mills grind the ½-in. feed to approximately minus 10-mesh and discharge into two 54-in. Akins classifiers. Each classifier overflow, amounting to 25% of original mill feed, constitutes part of the flotation feed. The sands from these two classifiers feed two 6x6-ft. grate discharge Eimco ball mills, which accomplish the finished grind on the final 75% of the feed. These ball mills are in closed circuit with two more 54-in. Akins classifiers.

The rod mills are charged with about 11½ tons of 2½-in. dia.x10-ft. high carbon steel rods, and are lined with 20 wave-type manganese steel liners. Rod use averages about 1.0 lb./T of ore ground, and liner wear averages about 0.09 lb./T. Each rod mill requires 80 hp. and turns at 23 rpm., which is 60% of critical speed.

The ball mills are charged with 11 tons of 1½-in. diameter high carbon steel balls and are lined with 16 Utaloy moly-chrome wave-type liners. Ball use averages 1.3 lb./T and liner wear averages about 0.03 lb./T of total ore fed to grinding section. Each ball mill requires about 105 hp. and turns at 20 rpm., which is 64% of critical speed.

Lime is added to each grinding mill feed and sodium cyanide is added to the classifier overflows or lead section feed.

Prior to 1946 the mill was run with single stage grinding, i.e., four rod mills in parallel, each in closed circuit with its own classifier making a finished grind.

The following advantages were realized in changing from one to two stage grinding:

1. Potential increase of approximately 67% in grinding capacity.

2. Operating at 33% increase in capacity has resulted in a reduction in power consumption of 18%.

3. A reduction of 23% in grinding media consumption per ton of ore ground.

4. A reduction of about 60% in liner consumption.

One man on each shift operates the grinding section, including the feeding, weighing and washing processes.

Water to the washing and grinding section, pumped from the Eagle River, is regulated through constant head barrels and drilled plugs. The quantity of water is fixed, with no control in the hands of the operator. The operator has control of the ore feed rate, which he endeavors to keep as close to a predetermined rate as possible, and the control of the ore split to the different mills. The grind is held within acceptable limits if the feed is maintained at the correct constant rate.

In case of breakdowns in the grinding section, any one mill can be cut out of the circuit and still keep the rest of the plant operating. Table II shows some typical screen analyses in the grinding circuit.

(This is the first of two parts of Mr. Craig's article. Part II will appear next month.)

Selecting Rods of the Proper Size for the Rod Mill

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SELECTION OF GRINDING RODS of the proper diameter for rod mills has been entirely a matter of judgment. This paper is the result of several attempts to derive an empirical equation for the purpose which would represent average present practice. The data used in deriving this equation have been published.[1]

Quantities used in the equation are:

R = Diameter in inches of new rods fed to mill.

F = Size in microns which 80% of the feed passes.

N = Percent of the critical speed at which the mill rotates.

S = Specific gravity of the unbroken mill feed.

D = Inside diameter of the mill in feet.

G = Rod-mill grindability of feed at 14 mesh.[2]

The equation derived is:

$$R = \sqrt{\left(\frac{0.156F}{N}\right)\sqrt{\frac{S}{G\sqrt{D}}}} \quad \ldots\ldots(1)$$

The proper size of rod to feed to the mill is the commercial size nearest to the value of R determined from equation (1).

If no A-C rod mill grindability test has been made on the feed, the approximate value of G to be used in equation (1) can be found from the accompanying table, using the estimated grinding resistance of the material.

Feed	Approximate Rod Mill Grindability at 14 Mesh
Extremely hard	6
Very hard	8
Hard	12
Medium	16
Soft	24
Very soft	32

Equation (1) gives the rod feed size for a wet open-circuit overflow rod mill, representing average present practice over the range of commercial mill sizes, but not including mills less than 2 ft. in diameter.

For example, a certain rod mill has feed with 80% passing 13,000 microns, as shown by the plotted screen analysis; runs at 53.3% critical speed; the specific gravity of the feed is 2.65, and its rod mill grindability at 14 mesh is 14.7; the inside diameter of the mill is 8.5 ft. From equation (1) the proper rod size is 3.08 in. and the mill is properly fed with 3-in. diameter rods.

For closed-circuit operation the value of F used should represent the new feed entering the mill, excluding the circulating load. Equation (1) may apply also to dry grinding and to grate-discharge mills and center-peripheral-discharge mills. It does not apply where a small percentage of excessively large feed has been artificially blended with the normal crusher product fed to the rod mill; in this case it is probably preferable to feed rods of two different sizes.

Mill capacity is decreased and power consumption per ton ground is increased by using rods which are either too large or too small. Oversize rods will decrease grinding by decreasing the contacting surface area of the grinding charge, and undersize rods will decrease grinding because the largest pieces in the feed are not broken efficiently.

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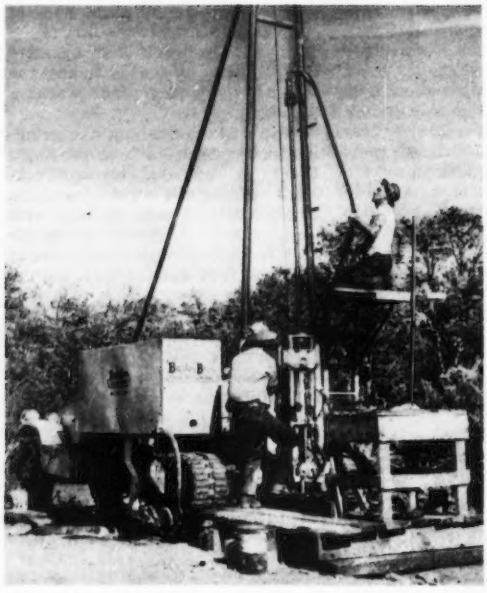
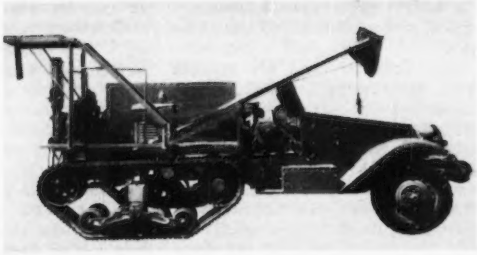
[2]Fred C. Bond: Standard Grindability Tests Tabulated, AIME *Trans.*, Vol. 183, p. 313 (1949).



MOST SUCCESSFUL unit used for exploration on the Colorado Plateau is a light screw-feed or hydraulic drill mounted on an army half-track.



PORTABILITY OF drill rig is a must. Army half-track is ideal for the rugged terrain of the Colorado Plateau.

CONGO-SET bit after drilling 640 ft. This bit is used in sandstone.

BORTZ-SET bit after drilling 500 ft. This bit is used in sticky formations.

Diamond Drilling for Uranium

WITH DIAMOND DRILLING going on at the rate of 300,000 to 400,000 ft. per year in the Colorado Plateau area, much has been learned about the best techniques suited to that area. The following article describes the nature of the formations drilled, the circumstances under which drilling is being done, and drilling methods employed by contractors in the area. At present eight contractors operating about 50 drills are active on the Plateau.

Prospect drilling is now going on in Mesa, Montrose, and San Miguel counties in Colorado, and San Juan and Grand counties in Utah. See accompanying map.

Formations Being Drilled

With the exception of the LaSal and Abajo mountains, the Colorado Plateau physiographic province is characterized by relatively horizontal sedimentary formations which have been uplifted and eroded into flat-topped plateaus and steep-walled canyons. A combination of alternating weak and resistant strata has resulted in the formation of rimrock topography.

Most of the formations exposed are horizontal with a few moderate folds and faults of small throw. The Morrison formation, which contains the ore deposits now being explored, consist of two members: the upper Brushy member and the lower Salt Wash member. Thickness varies from 400 to 900 ft. Throughout the area, the Morrison shows extreme variation in lithology from clays and siltstone to sandstone and conglomeratic sandstone. See accompanying geologic table.

The Brushy Basin member is a series of variegated shales and siltstones with minor layers and lenses of sandstone. Where erosion has removed part of the Brushy Basin, the top is covered by alluvium and sandstone boulders from the overlying Burro Canyon member of the Dakota formation. These sandstone boulders present a serious problem for the drillers attempting to maintain circulation.

The underlying Salt Wash member is characterized by fairly persistent lenses of ore bearing sandstone at the top, underlain by alternating shale and sandstone lenses and tongues.

Carnotite ore is found as impregnations in sandstone, shale pebbles, or as replacements of fossil plants. The mineral is soft, chalky, and very friable; consequently, a thin seam of high-grade ore is difficult to recover in cores. Orebodies vary greatly in size. An average size deposit yields approximately one hundred tons; a large orebody might contain ten thousand tons. The present mill grade ores are 1.25% V_2O_5 and 0.1% U_3O_8. Average grade for the Colorado mines has been 0.25% U_3O_8 and 1.85% V_2O_5.

Exploration Problems

Some small operators explore for ore by following exposures along canyon walls. The ore-bearing sandstone is followed by drifting, without much differentiation between development and mining. Underground diamond drilling has never

[1]The material in this article was contributed in part by the Diamond Core Drill Manufacturers Association, and was taken from an article submitted in the Association's annual contest by Alan G. Conner of the Christensen Diamond Products Co., Salt Lake City, Utah.

Section of the Morrison Formation near the Junction of Dolores and San Miguel Rivers, Montrose County, Colorado[1]

DAKOTA (?) SANDSTONE:

Sandstone, white, weathering, brown, medium to coarse grained, with lenses of conglomerate: resistant and cliff-forming.

MORRISON FORMATION (Upper Unit):	Feet
1. Shale, variegated, with thin and discontinuous beds of hard sandstone and limestone: forms slope	310
2. Sandstone, light gray, coarse grained and conglomeratic, massive, friable	40
3. Shale and thin sandstone: forms slope	28
LOWER UNIT:	
4. Sandstone, light brown and gray, medium to coarse grained, massive to lenticularly and irregularly bedded, cross bedded: forms vertical cliff and bench, ore bearing	60
5. Shale, red except upper few feet, which are gray, with thin sandstone lenses, forms poorly exposed slope	45
6. Sandstone, light brown and light gray, medium to coarse grained, massive to lenticularly and irregularly bedded: forms vertical cliff	21
7. Sandstone, shaley, with shale lenses, sandstone is light gray, coarse grained, massive, soft and friable; shale is reddish and sandy	24
8. Sandstone, like No. 6	8
9. Shale, like No. 5	12
10. Sandstone, light gray to buff, medium to coarse grained, thick bedded, cross bedded: forms vertical cliff	30
	578

SUMMERVILLE FORMATION:

Sandstone, argillaceous sandstone and shale, red, gray, and light colored in thin, even bed, or massive; forms a slope, and is poorly exposed.

[1]R. P. Fischer, Vanadium Deposits of Colorado and Utah, U. S. Geologic Survey Bulletin No. 936-P., p. 375, 1942.

On the Colorado Plateau

been followed much due to the spotty nature of the ores. The "seams" are often too thin to be recognizable.

When a mine approaches exhaustion, a series of vertical diamond drill holes are put down in advance of the underground workings in accordance with a pre-determined trend. The amount of drilling will depend upon favorable or unfavorable geological conditions as well as the resources of the operator. The spacing of drill holes becomes quite a problem. A barren hole may lead the operator to abandon prospecting in a section; yet later, another drill hole only 5 ft. away may show a 5 or 6-ft. thickness of ore.

In "wildcat" drilling, a line of drill holes may be chosen at 200 to 500-ft. intervals. If the cores from one hole show mineralization or indicate a trend of other favorable geologic conditions, drill holes are spaced at 50-ft. intervals to prove or disprove the presence of an orebody.

The drilling programs of the USGS and AEC have been directed principally around producing and former producing mines. These would include operations near Uravan, Gateway, Naturita and Slick Rock in Colorado; Thompsons and Polar Mesa in Utah, and Carrizo Mountains in Arizona. Drilling near Blanding, Utah, is scheduled to commence this year.

The extreme irregularity of the deposits and the risk involved in exploring for low-grade ore makes extensive drilling impossible by other than large companies and Government agencies.

Drilling Rigs in Use

Almost all drilling contractors mount drills on a truck or similar vehicles to facilitate moves between holes. Often drill holes bottom at 50 to 100 ft., and three moves in one day may be necessary. One contractor mounts a light screw-feed machine on the bed of a one-ton truck. Surplus army weapon carriers have been used, but their light weight requires the use of a dead man in some of the deeper holes. Light, portable drills similar to those used in geophysical prospecting were brought into the area in 1949. For drilling overburden and non-coring work, this unit proved very economical, but the excess power (145 hp.) of the truck engine made it nearly impossible to use standard AX equipment for coring. One contractor uses rather heavy (3,000-lb.) skid-mounted drills which are moved to new holes by a truck. The disadvantage here is the time necessary to load equipment and unload at each new location.

The most successful type of drilling rig is one using a light (1,500-lb.) screw-feed or hydraulic drill mounted on an army half-track. This unit is easily the most versatile one operating in the entire area. See illustrations. In addition to ease of operation in snow or mud, the half-track provides space for a pump, water tank, drill rod and other supplies, as well as a collapsible tripod.

With experienced drillers the hydraulic feed yields 30% greater footage than the screw-feed type of drill. With less experienced drillers, of course, there is greater danger of sticking the bit with a hydraulic feed drill. Most drilling with a screw-feed machine is done at 135 revolutions per inch advance. If a

body of persistent sandstone is encountered, the driller with a 60-feed gear can run out an 18-in. screw in about 25 sec.

The greatest problem is water supply. Excepting two large rivers, there are only a few small perennial creeks. In the spring, water is readily available from intermittent streams and small earth reservoirs. After the season runoff, in the late summer and fall, the water supply problem becomes acute, and water hauls of 8 to 10 miles are common. Ordinarily, three drills may be serviced by one water truck, except when lost circulation is encountered. As one contractor stated, "The cost of water will determine the price of the contract." If good drilling is encountered, water consumption can be as low as 12 gal. per ft. Drilling the Gypsum Valley district is always accompanied by high water loss, and footage drilled per shift is accordingly less.

Drilling Techniques

Depth of holes varies from 40 ft. to slightly over 600 ft. with an average depth being about 200 ft. Since most holes start in the Brushy Basin member, the first 10 ft. is generally gravel and sandstone boulders, overlying the shale and siltstone. After drilling BX size to 10 or 15 ft., conductor pipe is set and the hole is carried to total depth with an AX size bit. Casing to maintain circulation is not exceeded except in a few areas of badly broken ground. If a hole can be completed in two days or less, minor circulation troubles can be remedied by cement with alabaster, but where progress is impeded or where there is a deep hole, the usual mixture of lumnite and Portland cements is used.

The AX size is specified by the contract. In some cases, greater progress could be made by reducing after cementing or casing. This is true especially on Club Mesa, where circulation troubles plague the contractor from start to finish. In this area, the overburden is thicker than usual, and there exists in addition many small, related faults plus some slumping caused by solution of underlying salt beds. The contractor using conventional screw-feed or hydraulic machines carries BX hole deeper than usual or until a persistent shale stratum is reached, sets AX casing, and then relies on cementing if difficulties are encountered. Footage drilled in an 8-hr. day depends on local conditions such as amount of sandstone and shale in the section. It is not unusual to core 100 ft. in a day, making a 5-ft. run with the core barrel. As much as 207 ft. has been cored by one drill in a day.

The technique employed by a contractor using light, portable rotary drills is to drill to the expected ore zone (designated by a Government sampler) with a 3⅞-in. rock bit, and then core the remainder with a diamond bit. While using a water-base mud in good ground, as much as 300 ft. could be drilled in a shift. In excessive lost circulation areas, the cost of mud and high expense of hauling water forced the contractor to abandon the rotary drill in favor of cable tools. A spudder drills a 6-in. hole to about 70 ft. in one shift; then the hole is cased and the rotary drill moved on. The excess power of the rotary drill makes it difficult to use a standard AX double-tube core barrel. Unless the clutch plates are loosened or shear pins are provided in the transmission, twist-offs occur. One solution to this problem is to use a core barrel constructed of heavier stock and taking a 2¼-in. ODx1¼-in. ID diamond bit. Core recovery while using mud for the circulating medium was not as good as when using water.

With this one exception, all operators are using AX rigid double-tube core barrels. Core recovery with this type equipment is seldom less than 90%. Wear on core barrels is severe. To increase the life of a barrel, the head and reaming shell connection are hard surfaced. Without this protection, the cost for core barrels could be in excess of $0.15 per ft. drilled.

Representative types of diamond bits in use are illustrated. For many years, the lack of a hard, abrasive resistant matrix has caused early failure. With the perfection of a new powdered metal bit with high resistance to the abrasive action of the sand grains, the cost of bits has been reduced to about $0.05 per foot. In some instances, failure of a diamond bit will be caused by drilling through chert pebbles in the upper part of a hole, but a bit is generally capable of 750-1,000 ft. of drilling before salvage. The bit best suited for all-around performance is one with fairly large (4 to 7 stones per carat) Congo bortz, and having four waterways and a high diamond exposure. This type bit can drill 1 ft. of sandstone in as little as 20 sec. Another type bit which has been successfully used is made with eight or ten waterways and is set with ten to fifteen per carat bortz. Penetration in clays and siltstone is considerably faster with this type crown. Diamond-set reaming shells are never used. Drillers prefer to have the outside gage on the bit set heavy, and use a blank reaming shell, preferably a worn one, to get the maximum flow of water past the bit. Face discharge bits have been tried, but performance has not been as good as the conventional type. For drilling overburden, several types of saw-tooth bits have been tried, but although their cost in comparison to diamond bits is less, the penetration is not nearly as fast.

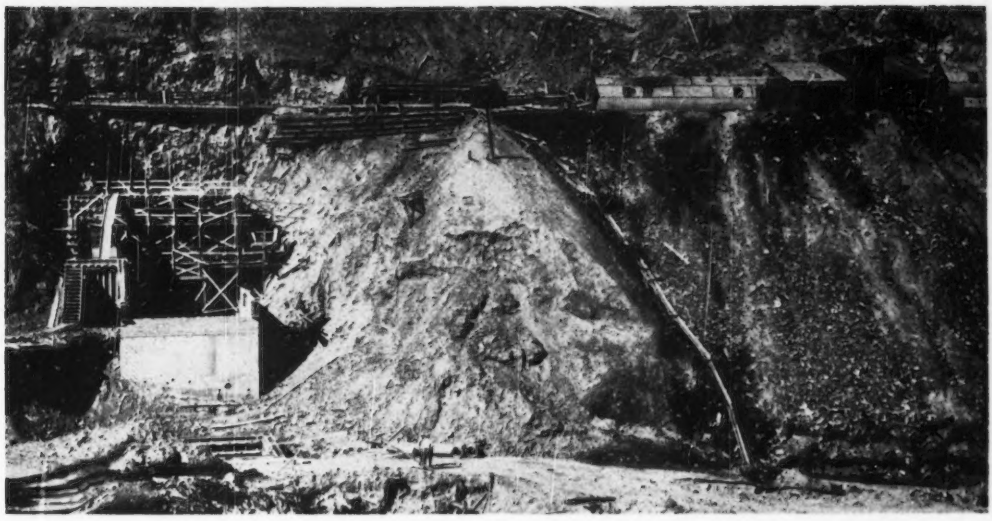
A pump manufactured originally for spraying crops has become the accepted standard in this region. One model delivering 10 gpm. with a maximum pressure of 400 psi. has been found adequate; another model having an output of 20 gpm. and a maximum pressure of 800 psi. is advantageous in some of the deeper holes where progress is slow. Of particular significance is the use of porcelain-lined cylinders and heavy-duty composition cups. Replacement of these items is made every two or three months. Brass liners and leather cups have failed after two days' service.

Contract Prices

The last contract awarded by the U. S. Geological Survey was bid at $2.21 per ft.* The bid price has varied, depending on locality, from $1.50 to $3.20 per ft. with added price for reaming on some contracts and no added reaming clause on others. At this price it is easily recognized that there is little room for improper drilling techniques or delays caused by faulty equipment. Seven months of favorable weather can be expected from May 1 to December 1; from December to May, progress will be slower due to heavy snows and the spring thaw. An average of 50 ft. per drill shift must be maintained during the spring and summer if the contractor is to realize a profit. As new techniques are developed and as drill crews become more experienced, contract drilling prices can be reduced accordingly. It is believed that over 5,000,000 ft. of core drilling will be needed to prospect the Morrison formation in this area.

The writer wishes to express thanks to Ray Sullivan of the Minerals Engineering Co. for many valuable suggestions, and to W. I. Harris for reading the manuscript.

*Manuscript received May 31, 1950.



BLACKBIRD MINE is operated by an adit 7,000 ft. long, which serves for main haulage. Portal is in upper center. At right is the temporary power and compressor plant. Construction for new crushing plant in lower left.

Howe Sound's Cobalt Mine Rapidly Nearing Production

Output will augment the country's supply of this important metal, which is now largely obtained abroad and needed for making special alloy steels

JOHN B. HUTTL
Associate Editor

THE 600-TON CONCENTRATOR will stand on this site. Mill and crusher plant foundations are ready for erection of the steelwork. Beyond, in background, may be seen the compressor house, nearing completion.

COBALT OCCURRENCES, in association with copper and gold, have long been known in the Blackbird mining district in Lemhi County, Idaho, and some of them have been worked. For the past five years, the Calera Mining Co., subsidiary of the Howe Sound Co., has been preparing a property, its Blackbird mine, for production, and is now equipping it with a 600-ton mill and surface plant. Mine and concentrator are at Forney.

In view of America's present dependence on imports for its requirements of cobalt, the recent happenings on the international scene and the role played by the cobalt metal in the production of special alloy steels make the development of this potential producer of the metal of great importance. Until now, the world's premier producer has been the Belgian Congo, followed by Canada, French Morocco, and Northern Rhodesia. These four countries and

PILOT PLANT installed in 1948 for large-scale and continuous test work stands at foot of slope below the adit level. It is equipped for crushing, grinding, flotation and filtering and will handle 2,000 lb. of ore per hour.

STAFF HOUSES, hotel, dormitory and central heating plant, in top picture, have been provided at Forney. The lower picture shows the new settlement for skilled workers and miners at the townsite.

the United States have contributed about 92% of the world output of cobalt in recent years.

While the presence of cobalt-bearing ores in the Blackbird area has been known for years, no market existed for the metal in the early days. Up to 1943 most activities were centered in working the copper-gold lodes and some gold placers. Relatively little was known about the deposits when the Calera company acquired its holdings in 1943. Extensive diamond drilling had been done previously by the U. S. Bureau of Mines. The management and field staff had little to go on in respect to the geology of the ore and the development program and metallurgical treatment required. Results and experience obtained in the five years have been gratifying and doubtless will lead to further expansion.

Mine in Primitive Area

The district proper is approximately 10 miles long and 4 miles wide. It extends northerly across the West Fork of Blackbird Creek to and beyond Panther Creek. It forms a small part of Idaho's so-called primitive area. All roads stop at the boundary of this uninhabited territory. The terrain is mountainous and rugged. The climate is typical of that prevailing in the northwestern section of the United States. Forney, where the company has built a model town, can be reached over narrow and, in places, steep roads designed for one-way traffic from Salmon, the county seat, North Fork, or Challis. Distances are 42, 60, and 48 miles, respectively. The roads are maintained by the Forest Service. Early construction by state or Federal

authorities of a well-graded road permitting two-way traffic would benefit the district.

Cobalt first received serious attention in 1915 when the Haynes Stellite Co. worked a property on Blackbird Creek on a limited scale in search of cobalt for use in high-speed cutting tools. In 1938 the Uncle Sam Mining & Milling Co. built a 75-ton flotation plant on its property. This recovered copper only. Mill heads averaged 1.7% cobalt, 4.5% copper, and 0.22 oz. gold per ton. Calera Mining Co. entered the district in 1943. Diamond drilling started the same year and underground exploration in 1945. Since then, more than 10,000 ft. of derground have been done; also 18,000 ft. of drifting and 2,000 ft. of raise and shaft work.

Ore Zones in Folded Quartzite

Rocks in the district are metamorphosed sediments of the Pre-Cambrian Yellowjacket formation, consisting chiefly of folded quartzitic and argillitic rocks. They are thought to be part of the widespread Belt series and are similar to the Wallace formation of the Coeur d'Alene area, 160 miles northwest. The Yellowjacket rocks have been intruded by numerous basic dikes. In the northern part of the district the formation is cut by granitic rock of the Idaho batholith.

At the Blackbird, near the center of the district, a block of argillaceous quartzite has been intensely folded, sheared, and mildly brecciated with the development of many schistose zones. A number of these shear and schist zones have been mineralized by cobaltite, chalcopyrite, pyrite, pyrrhotite, quartz, and some gold and silver, forming the ore deposits of the mine. The two principal deposits are the Brown Bear and the Chicago. These were developed by underground workings driven northwest along the ore-enclosing rocks for 7,000 ft. The zones differ from each other in that the Chicago is high in sulphide and quartz, and the other has ore that in general is low in sulphide and often occurs as nearly pure cobaltite grains in quartz-biotite schist.

The Chicago zone occurs on the 6,850, 7,100, and 7,200 levels, some of its ore shoots being 1,800 ft. long and 350 ft. high. They strike northwest and dip 50 to 75 deg. The footwall is well defined by sheared argillite. The hanging wall is somewhat irregular. Mining widths range from a few feet up to 40 ft. and average about 15 ft.

The mineralized schistose zones in the Brown Bear deposit strike north, dip almost 90 deg., and plunge 30 to 35 deg. N. The shoots occur more or less *en echelon* toward the northwest for about 1,000 ft. In places, their southern tips merge with one another and terminate against a northwest-trending shear zone dipping 50 deg. northeast. From here they extend north as much as 100 ft. and have widths of 5 to 30 ft.

Developed ore will be mined by cut-and-fill stoping. Mill tailings will be used as backfill.

Mine Opened on Five Levels

The mine and surface plant are in Blackbird Creek about 9 miles from the town. At the halfway point the company sawmill is situated, which provides lumber required for construction work and the mine.

Mine development consists of a main adit or haulage level 7,000 ft. long, known as the 6,850 level, and the 7,100, 7,200, 7,300 and 7,400 levels. On the main level, haulage is done with a Mancha Mule and a Ruth diesel locomotive drawing 1-ton mine cars. Electric power for mine and surface plant is furnished by a 100-kw. diesel generator installed in the building near the portal of the 6,850 adit. This building likewise houses the compressor equipment.

Just below the tunnel portal is the pilot plant installed in 1948 for large-scale and continuous test work. It is equipped with crushing, grinding, flotation and filter equipment, and handles 2,000 lb. of ore an hour. It was here that the answer to selective cobalt flotation was found during 1949. Treatment involves long conditioning of the pulp with lime at 80 to 90 deg. F., followed successively by copper flotation, iron flotation, and cobalt flotation. A high-grade cobalt concentrate is produced with 80 to 85% recovery. Sand from the tailings and the iron concentrates will be pumped back into the mine for backfill.

Construction Well Advanced

Some of the construction work done under the program started in the spring of 1949 is shown in pictures. At the mine, four large steel buildings sheathed with aluminum, general office, and garage building have been completed. Near the mill site, the compressor house is nearing completion. Mill and crusher plant foundations are ready to receive the steel superstructures. The mill, designed to handle 600 tons of ore a day, as stated, will provide for one-stage crushing, grinding in a 7x12-ft. rod mill, followed by grinding to 60% —200 mesh in an 8x9-ft. ball mill with 72-in. classifier, flotation of copper, iron and cobalt, thickening and filtering. The 500-ton fine-ore storage bin at the head of the mill will be connected with the crushing plant by a long incline conveyor.

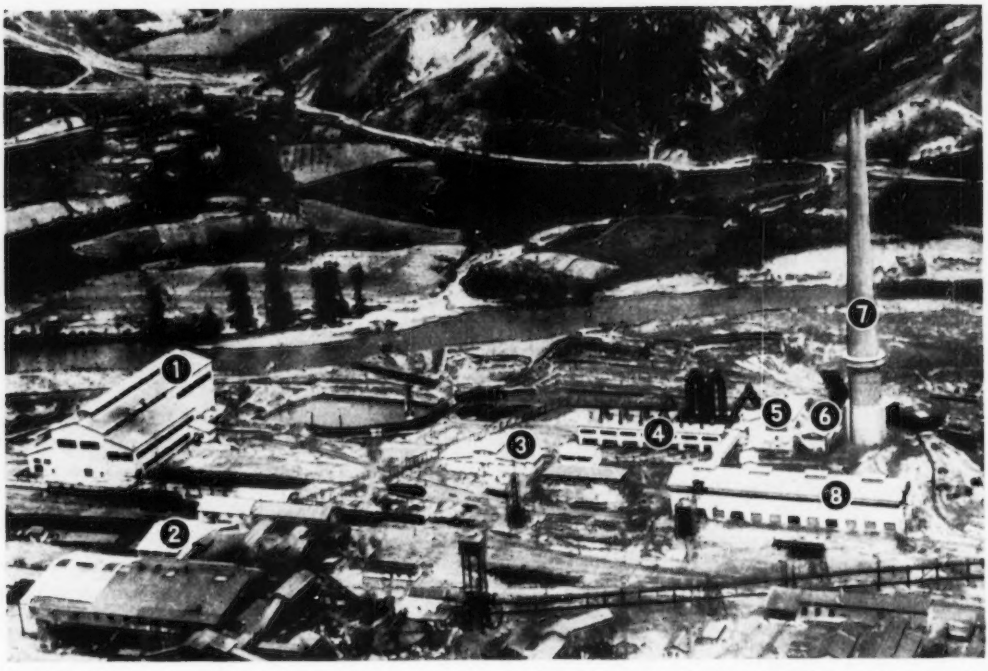
Buildings completed at the Forney townsite include a 54-man dormitory; a hotel with a dining room for 120 men; six 5-room houses for staff members; one 6-room house for department heads; the manager's residence and a guest house; two apartment buildings; and a central heating plant. A four-room school building is also under construction. A large number of attractive houses have been built near the settlement by permanent and skilled workers. The company advances up to $2,500 for construction of such dwellings under a special finance plan.

Power for the townsite pending the completion of the Idaho Power Co.'s powerline is being furnished by a 50-kw. and a 37½-kw. diesel generator, both installed in the central heating plant. The power company is building a 69-kw. power line from Brannock, Mont., to the mine. When completed this fall, it will be 99 miles long. The Forney townsite is served by a modern sewage disposal plant and a water system.

Refinery to Be Built

Cobalt concentrates will be shipped to a refinery to be built by the company in the Salt Lake City area and capable of producing 2,000,000 lb. of cobalt a year. Copper concentrates will be shipped to a custom smelter.

H. H. Sharp is president of Howe Sound Co.; H. A. Pearse, vice president; and V. H. Clark, executive mining engineer. Operations at Forney are directed by Edwin B. Douglas, manager. His staff includes the following: C. J. Whitley, chief engineer; Royce Richardson, chief accountant; Ward Carithers, geologist; R. L. Soderberg, research engineer; A. W. Legard, master mechanic; Oliver Hower, metallurgist; and R. B. Meen, mine foreman.



TREPCA LEAD SMELTER AND REFINERY, at Zvecan, Yugoslavia, essentially as it appeared when taken over by the Germans in April, 1941. 1, Refinery. 2. Concentrator. 3, Change house. 4, Ore-hearth building with goose necks and coolers. 5, Bag house. 6, Fan house. 7, Four-hundred-foot stack. 8, Storage building.

Trepca's Ore Hearth Output Set Record During World War II

Plant in Yugoslavia, newly built at time, had reached an average monthly peak of 20.771 short tons of bullion per hearth-day when it passed into German hands in 1941. It was also first hearth plant to run wholly on flotation concentrates.

JOHN S. STEWART
Consulting Metallurgical Engineer
New York

THE PROBLEM OF whether or not to build a smelter and refinery, to treat the entire production of lead concentrates of Trepca Mines, presented itself in the spring of 1937. At that time the concentrates were being shipped to European smelters for treatment. The preliminary report was made at the site of the property at Zvecan, Yugoslavia.

A choice between ore-hearth smelting or sintering and blast-furnace smelting of the 80% lead flotation concentrates was the first decision to be made. Eighty percent concentrates are ideal for ore-hearth smelting when jig or table concentrates are to be treated, but all references available at the time indicated that no more than 30% flotation concentrates could be handled on the hearth and must be mixed with 70% coarse concentrates. A further general rule was in vogue that silver-bearing material could not be treated on the ore-hearth.

On the other hand, sintering and blast-furnace smelting of 80% concentrates would require considerable dilution with slag or other diluents.

Estimates of the cost of treatment of the two systems of smelting indicated an overwhelming balance in favor of ore-hearth smelting. Therefore, general layout plans for an ore-hearth smelter, with adequate bag-house, flues, cooling system, and a storage building with feeder bins for mixing the ingredients of the hearth charge, as well

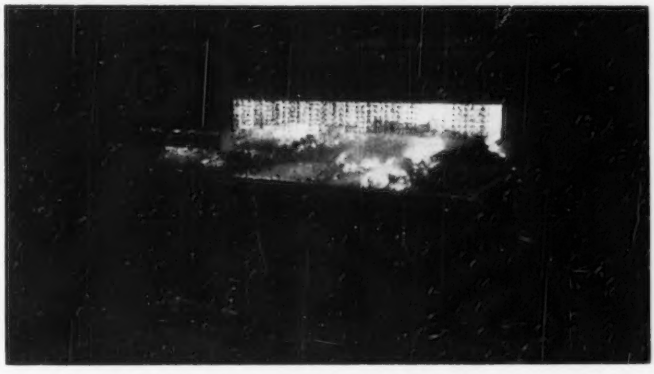
as a lead refinery, were included in the report. The final layout design deviated only slightly from this original scheme. To check on the feasibility of ore-hearth smelting on all-flotation concentrates, a test run was made on the Trepca product at the Mill Close smelter, Derbyshire, England.

When it was decided to go ahead with the project, the agreement with the Yugoslav Government provided for a smelter and refinery with a capacity of 12,000 metric tons of lead for the year 1940, and the plant to be extended so that by 1941 it would have a capacity to treat all of the Trepca lead concentrates. The plant was designed for a maximum of 280 metric tons of lead per day, although 250 metric tons was considered the probable tonnage by the mines and mill.

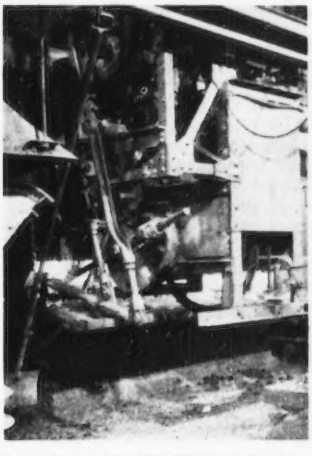
Four hearths were considered sufficient to produce the 12,000 metric tons of lead, but six 8-ft. Newnam hearths were installed. When the war started in September, 1939, the company invoked the *force majeure* clause of the agreement and the plant was not extended. While six hearths with auxiliary equipment were available, due to prior commitments for the sale of lead concentrates, only enough concentrates were allotted to the smelter during 1940 to run three hearths. Starting in January, 1941, this was stepped up so that four hearths were operated.

In starting the hearth plant, since none of the Serbian or Albanian workmen available had ever seen a hearth furnace, a crew of blacksmiths and their helpers were

CONCENTRATES to be smelted, also burnt baghouse fume, coke breeze, coal, and limestone for mixing and charging were kept here in storage building. On right are six bins with plate feeders for delivering charge to gathering belt.



A NEWNAM HEARTH in operation. The ore hearths in service in the plant are rabbled mechanically, as shown at left below.



NEWNAM RABBLER and backing shovel is used on the hearths.

HEARTH BULLION flowing from hearth into large-block molds. The large blocks, weighing up to 8 metric tons, are transferred to melting kettle.

TABLE I—Average Daily Hearth Figures for October, 1940

Grade of flotation concentrates, 80.49% lead
Hearth days, 92.60

Charge per day	Metric Tons	Short Tons	Percentage
Dry concentrates	26.965	29.724	72.01
Flue dust & burned baghouse fume	8.290	9.138	22.14
Refinery drosses	1.003	1.106	2.68
Limestone	1.188	1.309	3.17
Total charged	37.446	41.277	100.00

TABLE II—Daily Average Bullion Production Per Hearth

	Metric Tons	Short Tons
Hearth average of three hearths for month	18.843	20.771
Best single-hearth day during month	23.750	26.180
Best single hearth 8-hr. shift	8.584	9.462

Average tonnage of grey slag per hearth-day, 6.0 metric tons, running 45.39% lead.

TABLE III—Average Analyses of Concentrate and Slag for Year 1940

	Pb%	Zn%	Fe%	Cu%	As%	Sb%	Bi%	Insol, %	CaO%	Al_2O_3%	S%	Ag Oz./m.t.
Dry concentrate	79.82	0.23	3.40	0.19	0.04	0.13	0.152	0.34	....	...	...	34.99
Grey slag	44.19	1.65	15.35	0.53	0.15	0.17	0.048	5.95	12.90	4.78	3.76	10.97

TABLE IV—Distribution of Lead and Silver for Year 1940(a)

	Lead	Silver
Charged to hearths		
In concentrates and refinery skims	100.00%	100.00%
Produced		
In bullion and on hand	84.19%	90.40%
Grey slags	13.74	7.86
Lost or unaccounted for	2.07	1.73
	100.00%	100.00%

(a) The flue dust and bag-house fume produced and charged were always kept in balance, so that the lead and silver contained in these products do not enter into the computation of this table.

TABLE V—Average Analyses for the Year 1940

Hearth bullion charged to kettle:

Sb%	As%	Cu%	Bi%	Ag Gm./m.t.
0.083	0.0046	0.176	0.197	1,445

Refined lead shipped:

Sb%	As%	Cu%	Zn%	Fe%
tr.	tr.	0.0001	0.0005	0.0010

Cd%	Bi%	Ag%
0.0015	0.0108	0.0006

chosen to be trained for the first hearth. The supply of blacksmiths soon ran out, so for the other two hearths some mechanics, but mostly peasants from the adjoining farms, were taken on to fill the crews.

We were fortunate in obtaining a hearth foreman from the Mill Close smelter. He had had many years' experience as a furnaceman and was an expert on the regulation and repair of the Newnam rabbler and backing shovel. This man was put in charge of the hearth department, and quickly trained his men into competent operators.

The fires were started on the first hearth Dec. 21, 1939. Frozen water lines on the 23d caused a shutdown. The hearth was restarted Dec. 24, a second on Dec. 27, and a third hearth on Jan. 10, 1940.

The daily average hearth lead production for the month of January was 9.2 metric tons; for February through May, on three hearths, 12.3 metric tons was the daily average per hearth. In June the furnacemen were put on a piece-work basis, being paid on the daily tonnage of lead produced. Immediately production increased; 15 metric tons per hearth was the daily average lead production for this month. The furnacemen were delighted with this opportunity to increase their pay, and a contest soon developed between the furnace crews so that each month's production increased until a peak was reached in October, 1940.

Average daily hearth tonnages for November and December were only slightly lower than October. With four hearths running during January and February, 1941, due to partially frozen concentrates, training a new crew for the fourth hearth and possibly the general political unrest that prevailed, the hearth tonnage dropped to a little above 16 metric tons.

FEATURES OF THE TREPCA HEARTH OPERATION

1. The concentrates treated on the hearth were made exclusively by flotation.

2. Well-mixed charge was delivered by belt conveyor to bins directly in front of each hearth.

3. The fuel was mixed in and was a part of the charge.

4. Poor grade coal, 50%, and coke breeze, 50%, used for fuel.

5. Limestone was added to the charge to dry up the grey slag.[1] Without limestone, the high FeO content made a fluid slag that would not ball.

6. Bag-house fume was well-burned and mostly crystalline.

7. The full shift's tonnage of lead from each hearth was cast in one large-block mold.

8. All of the finished refinery drosses, except the arsenic and antimony dross, were smelted on the hearths.

9. The native workmen became excellent hearthmen and were eager to make the most of the piecework method of wage payment.

In the Refinery

The lead refinery produced low-bismuth refined lead, 998.7 fine silver, 99.9% bismuth, fused zinc chloride and calcium-lead alloy. The well-known Parks process was used. A dry oxide dross was skimmed from the melted bullion. After the addition of sulphur, a dry copper dross was skimmed. Arsenic and antimony were eliminated by caustic and niter and the dry dross was stored for future treatment. After desilverization, most of the residual zinc left in the lead was removed by chlorine; the last traces were taken out by caustic. After distilling the zinc from the silver drosses,

[1] A Stewart-type inverted-bosh blast-furnace, for smelting the grey slag, was under construction when the Germans invaded the country. It is believed this furnace was never completed.

the retort metal was cupelled on a tilting cupell and the silver molded.

Calcium and magnesium were used to debismuthize the lead and the residual calcium and magnesium were removed by chlorine, followed by a final caustic treatment; the bismuth was produced by treating the high bismuth dross in the usual manner. The highest bismuth in any lot of refined lead shipped was 0.0145%; the lowest contained 0.0069% Bi. The refined lead was cast on a standard Newnam casting machine, transported to the scale and thence to the railroad car loading platform by a Newnam lead lift-buggy in 35 bar lots, then loaded into open cars by gantry crane.

FEATURES OF THE REFINERY

1. Charging the large hearth-blocks of bullion by the refinery crane to the kettles proved to be an easy, simple, quick and safe method. Twenty-three blocks were first charged to a cold kettle, and additional ones charged as the kettle melted down.

2. The kettles held 300 metric tons when brimfull, but only 280 tons was charged. The coal used was very poor grade, at times running 26% ash. The coal was fed by Iron Fireman stokers.

3. Using calcium and magnesium alone, the bismuth in the refined lead was reduced to 0.01%.

4. An improved zinc retort was used to treat the silver drosses.

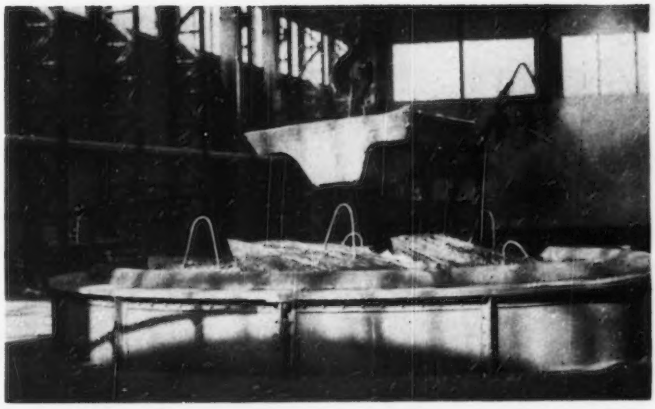
Better Results Are Possible

With certain improvements, the ore-hearth can be designed to be the best process for smelting high-grade lead concentrates. Eighty-five percent of the lead in the concentrates is produced as bullion in one operation, and the grey slag is in suitable physical condition for blast-furnace smelting if smelted soon after it is produced. If the grey slag is allowed to stand some time in the open, the CaO contained will slake and the slag will weather or disintegrate into small pieces unsuitable for the blast furnace. But weathered grey slag is a product that may be easily sintered without additions to produce a low-sulphur sinter.

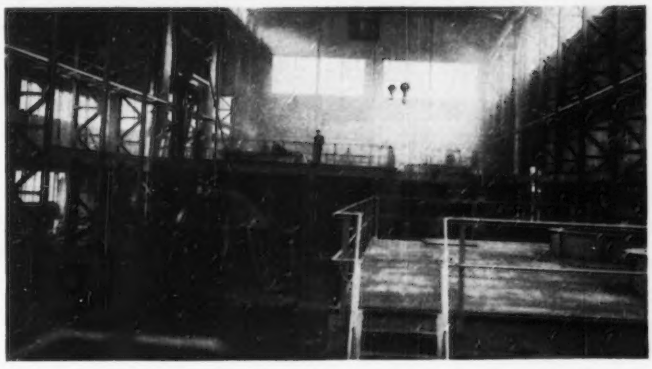
The main objection to the ore-hearth for a given concentrate is that lead production is directly in the hands of the furnacemen and not under smelter management control. You cannot get lead off a hearth unless you put it on. The work on the present hearth is always strenuous, and during the hot summer days it is difficult to maintain tonnages. On a large hearth smelter, you cannot hire all furnacemen of equal strength, endurance and willingness to produce, even when they are paid on the lead-tonnage basis. With many hearths operating, the best furnacemen will produce nearly twice as much lead as the poorest operator. Many of the world's largest lead smelters have concentrates that could better be smelted on the hearth furnace, but the prospect of control of output by the workmen is a deterrent. Therefore, the trend has been away from ore-hearth installation. However, it is most probable that the lead industry will again look with favor on ore-hearth smelting.

The late William E. Newnam made a tremendous contribution when he developed the mechanical rabbler and backing shovel to supplant the old hand-rabbled Scotch hearth, but further improvements are necessary, under present labor conditions, to bring the ore-hearth to its maximum limit of production. An improved ore-hearth type smelter can easily be designed that would relieve the hearth furnacemen of nearly all of the arduous labor now necessary on the present hearth. A mechanical charging device, to supplant hand shoveling, presents no problem.

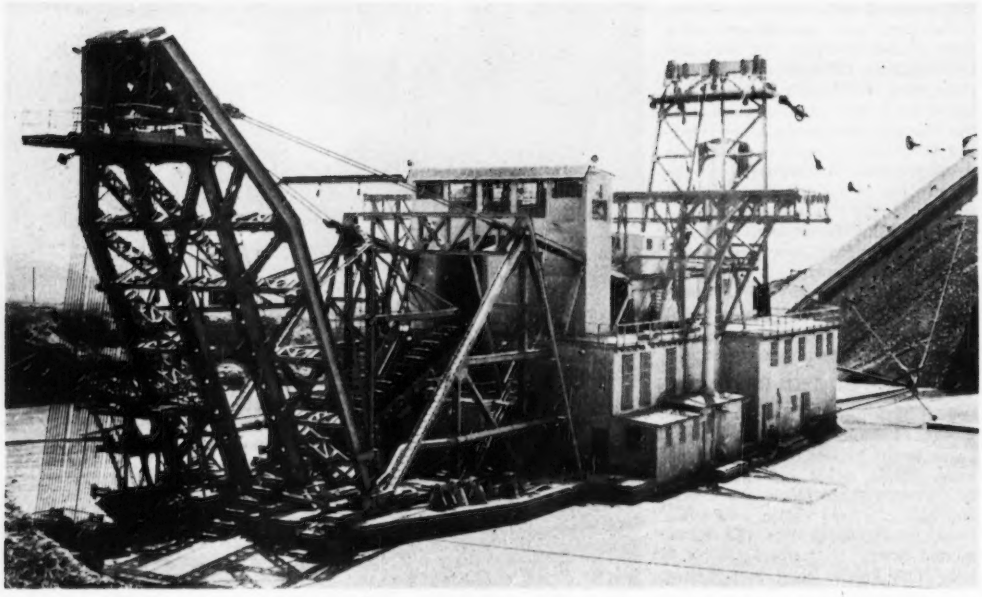
Based on the best single-hearth, eight-hour shift at Trepca, the 24-hr. limit on an 8-ft. hearth, with hand charging, appeared to be 28.386 short tons of lead if the single-shift rate could be continued for 24 hr. With a further mechanized design of hearth smelter, it is believed the hearth limit may be extended beyond the above figure and maintained daily, and the control of production would pass to the smelter management.



CHARGING LARGE HEARTH BLOCKS to melting kettle in the lead refinery of the Trepca plant. The blocks weigh 8 tons each on the average. The capacity of this kettle is 300 metric tons.



INSIDE THE REFINERY. Main kettle platform appears in background. Segments of new 300-metric-ton kettle are being welded. In right foreground are kettles for treating bismuth dross and producing calcium-lead alloy.



TWIN STACKERS on this bucketline dredge in operation near the mouth of Copper Canyon, Nevada, allows spreading of waste gravel over a wider area. The only such unit in the state, this dredge handles 500 yd. per hour.

How Natomas Keeps A Large Dredge

Chief problems were power and water supply. How they were solved at the Greenan placer is revealed in this article.

JOHN B. HUTTL
Associate Editor

TO COME UPON a large bucketline dredge operating in deep desert country is indeed a most unexpected sight. This will happen to the traveler when he approaches the mouth of Copper Canyon going south on the gravel highway branching off U. S. Highway 40 at the town of Battle Mountain, Lander County, Nevada. Here, about 18 miles south of Battle Mountain, is the Greenan placer enterprise of Natomas Co., involving operation of a modern $9\frac{1}{2}$-cu.ft. bucketline dredge and steam power plant, and maintenance of a model camp.

The undertaking is unique and of more than ordinary interest. Here large-scale dredging operations are successfully conducted in territory where the two main elements required for this work—water and electric power—were absent and had to be developed on the ground.

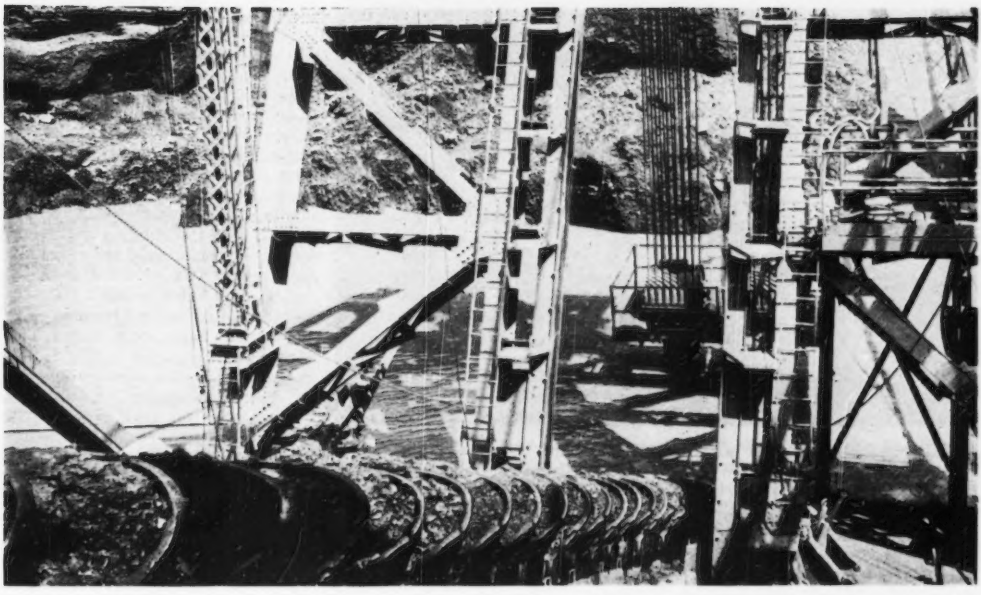
The deposits under exploitation extend from the mouth of Copper Canyon into the valley below. Current operations are conducted near the upper end of the property. Placer gold was discovered at the mouth of the canyon in 1913 by James Dahl, an experienced placer miner, and the available channels were subsequently worked by drift mining methods, with the gravel treated in hand rockers and sluices.

Water Scarcity a Problem

With the exhaustion of the richer gravels, the low-grade channels were periodically worked by different operators by means of small draglines and power shovels, the gold being recovered in sluices and portable washing plants. Scarcity of water has deterred full development of the placers ever since their discovery. Much of the gold recovered from these operations was coarse and ranged from 830 to 890 in fineness. The gravels are subangular rocks and sand roughly stratified by intermittent stream action. Gold values are highest on or directly above bedrock, but in some areas values are found throughout the gravel bank.

Limonite, quartz, and pyrite are occasionally attached to the gold, indicating that the gold is local in origin and has not traveled far from its source. It is believed that the gold was derived from the copper-gold deposits a short distance east of the placers. The gravel handled today by the dredge is coarse, angular, abrasive, and hard digging in nature. Some large boulders occur at the upper end of the property.

Natomas entered the district in 1939. Following completion of a comprehensive prospecting and drilling campaign, construction of a dragline dredge was started in 1941. The work was suspended soon after issuance of gold mine closing order L-208. Construction work was resumed after World War II, and the dredge went into operation late in December, 1946. This



WINCHMAN'S VIEW OF BUCKETLINE. These 9½-cu.ft. buckets clean bedrock down to 85 ft. below water line, come up with gravel at 35 buckets per min. D.c. motors permit high speed and flexibility of control.

Operating in the Desert

unit worked relatively shallow ground at the upper end of the property and completed operations in September, 1948. It had handled some 1,000,000 yd. of gravel.

Construction of the bucketline dredge now in operation was started in March, 1948. It had worked for many years at Manhattan, Nev., before being dismantled and transferred to the present site. Actual dredging of gravel commenced Sept. 1, 1949. To meet the requirements of the Greenan gravels, the dredge was redesigned. Some of the major alterations included: (1) lengthening of the bucket ladder to make possible deeper digging; (2) installation of longer stackers; (3) addition of longitudinal pontoons to the cellular-type steel hull to improve buoyancy; (4) reinforcement of superstructure sections to take care of extra loads imposed by construction changes.

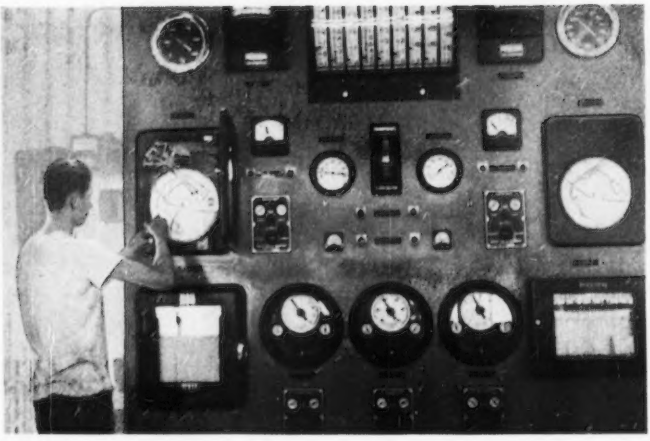
Handles 500 Yd. an Hour

The dredge is about 400 ft. long from the tip of the digging ladder to the end of the stackers, and displaces 2,600 tons. Total digging depth is 100 ft., 85 ft. below water line and 15 ft. of bank. The ladder is 162 ft. long between centers and carries 120 buckets, each of 9½-cu.ft. capacity. Some have detachable lips and others riveted lips of Amsco and Columbia manufacture, respectively. Operating at a speed of 35 buckets per min., the bucket line can dig 500 yd. of gravel an hour on the average.

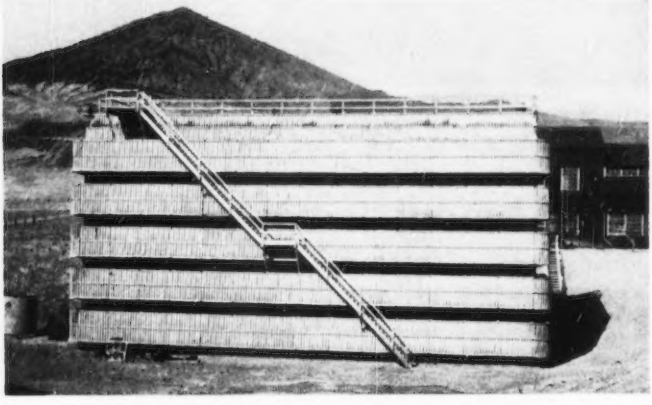
The two stackers measure 185 ft. between centers and use 38-in. rubber belts. Use of twin stackers makes possible the spreading of waste gravel over a wider area, and as a consequence reduces the danger of its sloughing into the dredge pond. The trommel has an inside diameter of 8 ft. and is divided into 7 screen sections. The three upper sections use screens with ¼-in. openings, the next three have screens with ⅜-in. openings, and the last ½-in. and ⅞-in. openings. Upper and lower tumblers are of standard design and construction. The bucketline drive and bow winches are actuated by direct-current motors, producing variable speed and constant torque characteristics.

Power required by the different operating units and supplied by appropriate electric motors is as follows: bow winches, 30 hp.; ladder hoist, 250 hp.; bucketline drive, dual, two 100-hp., 230-v., d.c. motors; trommel drive, dual, two 40-hp. motors; five-drum sideline winch, 75 hp.; stackers, dual, two 50-hp. motors on each stacker. A 600-hp. motor-generator set for producing direct current is installed in the hull, which is of pontoon-type construction and is 10 ft. deep. Electric power is brought aboard the dredge by a submarine cable supported on floats and carrying 4,160 v. The single steel spud is of conventional design and construction. Controls in the winch room are fully pneumatic-electric.

All pumps used on the dredge are of Byron-Jackson make and are direct connected. Equipment includes a 14-in. high-pressure, 5,000-g.p.m., 60-ft. head pump, supplying water for the trommel; 14-in. low-pressure, 6,000-g.p.m., 30-ft. head pump; two 8-in., 2,000-g.p.m., 100-ft. head pumps; one 8-in., 2,750-g.p.m., 199-ft. head pump for the 3-in. hydraulic monitor used to



BOILER IS CONTROLLED by this instrument panel. Producing steam at the rate of 33,000 lb. per hr., it furnishes power turbine requirements.



THIS LARGE COOLING TOWER reduces the temperature of the circulating water required in power plant operation at Greenan placer.

ELECTRIC POWER for bucketline dredge and camp is supplied by this 2,500-kw. steam turbine. Control panel and switchboard are at right

sluice down the bank above water level.

Ball Mill Polishes Gold

Gold-saving equipment consists of sixteen 42x42-in. Pan-American placer jigs, with eight units installed on each side of the trommel. The jigs are fed by a novel distributor and launder system with controls to adjust the load to each jig. Below the rougher jig banks is a conventional gold table installation using double-deck Hungarian riffles. The hutch product from the rougher jigs after passing over gold tables with both augur hole type and Hungarian riffles is elevated by a bucket elevator and fed to single Pan-American 42x42-in. cleaner jigs on each side of the trommel. Hutch product from the cleaner jigs is treated in a Straub ball mill. Purpose of the ball mill is to polish coated gold previously difficult to amalgamate. The ball mill discharge is passed over a set of gold-saving tables. The dredge is shut down every 10 days for cleanup and maintenance.

The two principal supporting units are the steam power plant and the pumping system, which furnishes water for the dredge, power plant, and camp. Water is obtained from two sources: (1) Willow Creek, 3 miles distant, through a gravity system; (2) a deep well-booster pump installation. The latter consists of a 12-in. F-M 1,600-g.p.m. deep well pump in a 16-in. well casing driven by a 100-hp. motor and located some 2½ miles from the dredge site, and two 900-g.p.m., two-stage, 375-ft. head, 125-hp. centrifugal pumps at each of the two booster stations. The pumps are connected to a 14-in. pipe system. Pumping heads from the deep well to the first booster station and from the second booster station to the discharge point above the dredge site are 387 ft. and 320 ft., respectively, or a total of 700 ft. Total power requirement is 600 hp.

Steam the Only Choice

Choice of steam power was dictated by the fact that the equipment now in operation was the only equipment available for quick delivery at the time construction and layout of the dredge enterprise were in progress. As it is, steam power has worked out most satisfactorily. The plant is designed to meet all requirements as to load and conditions imposed by desert country. Plant units are installed com-

pactly, yet sufficient room is available at all points to afford easy access during repairs. The grill type steel floor dividing the turbine room from the ground floor containing the boiler and auxiliaries permits the operator to observe the equipment below at all times. In the eastern extension of the power house are the repair shops equipped with essential machine tools and equipment. Except for large dredge parts like tumblers and others, which are repaired in the company's main shops at Natoma, Calif., all machinery can be repaired at the local shops.

The principal power generating unit is a 2,500-kw. G. E. 13-stage, 3,600-r.p.m., 350 psi. steam turbine. Supporting units include: a Puget Sound Engineering Co. boiler furnishing 33,000 lb. of steam per hr. at 350 psi. and 750 deg. F. superheat fired by three Cohn burners using heavy fuel oil, Specification 400; a Permutit water treatment unit, from which water passes successively through an evaporator and combination preheater and deaerator to the boiler; I-R surface condenser; two boiler feed pumps, one steam-driven, the other driven by a 50-hp. motor; three condenser circulating pumps driven by 40-hp. motors; Fluor Corp. cooling tower for circulating water; forced draft and induced draft fans driven by 25 and 30-hp. motors, respectively; two 5-hp. fuel pumps, steam and electric driven; two 5-hp. hot well pumps, steam and electrically driven, respectively.

Fuel oil is preheated by steam, and a complete lubricating oil filtering system is available on the ground floor of the powerhouse. The turbine control panel and switchboard are on the turbine floor, while the boiler control panel is on the ground floor a short distance from the boiler. Here also are installed two 100-hp. G. E. diesel generator units for standby purposes.

Workers Have Model Camp

The dredge, which is the only bucketline unit in operation in Nevada, plus the camp and supporting facilities, were engineered and built by Natomas Co. In the model camp are 22 modern dwellings for families, and a bunkhouse for single men. Near the powerhouse are the general office, warehouse, and retort room. The operating crew totals 39 men for the entire project. This includes the staff and repair shop personnel consisting of a machinist, welder and general mechanic.

R. G. Smith is president and general manager of Natomas Co. Operations at Greenan Placer are directed by C. E. McKay, resident manager. He is assisted by W. D. Bottini, engineer; H. B. Prince, office manager; G. B. Blake, chief engineer, powerhouse; J. W. McClure, chief electrician; and George Guiler, dredgemaster.

Converting Single-Phase Power into Three-Phase Current for the Plant

AN INTERESTING INNOVATION at the diatomite processing plant of the Eagle-Picher Co. at Clark Station, Storey County, Nevada, and one that has materially cut power costs during cleanups and weekend shutdown is the simple installation used to convert 440-v. single-phase power taken from the Sierra Pacific Power Co.'s line into 440-v. three-phase current for the processing plant. During the work week electric power for this plant is furnished by three 160-hp. diesel engines. Power bought from the utility company, amounting to about 50 kw., is sufficient for lighting, heating, emersion heaters, and other service. To utilize it during shutdowns, however, and to relieve the diesel plant during peak loads require conversions of current from single-phase to three-phase.

This conversion is satisfactorily effected by driving a 50-hp. three-phase 440-v. motor with a 3-hp. single-phase motor, and taking three-phase power from the three motor leads.

In this operation, the large motor, after its rotor has been brought up to synchronous speed, develops a quadrature field or speed field, which, combined with the stator or transformer field, produces a magnetic field. Save for leakage reactance and resistance drops in the windings, the rotating field is constant in magnitude at synchronous speed. Inasmuch as one phase of the converter acts as a motor and the others act as generators, the impedance drops cannot produce the same effect in the terminal voltage of each phase, so the three-phase voltage will be somewhat unbalanced. This unbalance is estimated to be about 5 to 8% of the single-phase voltage, depending on the three-phase load. Change in the three-phase load alters the transformer field, and in turn the impedance drops in the windings. The wattless components are compensated for by means of static capacitors which give better voltage balance, as well as improve the power factor of the system.

The development described is not new. Several 5-kw. installations have been in service in and around the city of Reno for some time. However, the Clark installation is the first in which the 5-kw. figure is upped to 50 kw. Equipment and installation cost was $1,250, of which $450 represents the cost of three 20-kva. capacitors, and $800 for meter units and wiring.

Comparison of operating costs between the 10-kva. Kohler plant when operated from 8 a.m. Saturday to 1 a.m. Monday and the installation described will be of interest.

KOHLER PLANT

Gasoline and oil	$24.40
Maintenance	10.00
Labor	9.80
Light, heat only	$44.20
Weekends	4.30
	$190.06

SINGLE PHASE

Light, heat and emersion heaters	72-kw.hr.
Cost per kw.hr.	$ 0.0202
Per weekend	14.54
Weekends	4.3
	$62.52

In addition, utilization of the available utility power makes possible reduced diesel engine loads with resultant savings in fuel and lubricating oils, and repairs. The conversion plant described was installed under the direction of T. A. Copeland, manager.

KEEPING TAB ON PRACTICE

The Mobile Compressor. A trend to a much wider use of the electrically-driven mine car compressor or its equivalent portable type than has heretofore been the vogue appears to be developing. Interest in such equipment is exhibited in various quarters, particularly in Birmingham in connection with trackless mining underground and at a large open-cut mine in the West where the compressors would serve respective wagon drills. Inquiries are reported for units of 230-260 cfm.

The advent of wide-spread roof-bolting practice in both coal and metal mining is a major factor in the development of this trend. An already-big demand for mine-car compressors is growing as a direct result. Many coal mines had no use for compressed air until they started drilling holes for roof bolts. These are usually smaller compressors, of 115 to 120-cfm. capacity, driven by d.c. motors.

Prompting this keen interest, in general, is the desire to reduce operating costs. If the compressor can be brought close to the drill, the need for an elaborate system for distributing compressed air, with all its inefficiency, disappears. Power must be brought to the compressor, a further step in electrification, if current has not been available. In its oil-shale mine at Rifle, the Bureau of Mines has gone still another step and assembled drills and drill carriage in the same unit with the air compressor.

This further attack on operating costs follows naturally in the chain of innovations introduced in the post-war period. Drills, drill bits, drill mountings, and drilling procedures have been improved in ways startling to anyone who considered mining practice static. Better blasting methods, more and better built mechanical loaders, conveyors, shuttle cars and the recent serious turn to trackless mining all have helped. The inquiring engineer asks, what next?

And, for the record, we recall that the prewar decade saw the serious development of the detachable steel bit for wide-spread use, efforts to produce lighter, stronger drills; also the application of diamond drilling to blast-hole work with the evolution of ring drilling and bench-drilling methods; and, in open pits, the development of heavy-duty off-the-highway trucks and conveyors for moving ore and waste on a large scale. So we repeat the above inquiry, what next?

Powdered-Metal vs. Cast-Type Bits. Most diamond-drill bits sold are being made by the powdered-metal process, states Patrick Adamson, of Wheel Trueing Tool Co., Detroit. The cast bits, being cheaper to produce, are often supplied where buying is on a price basis, as on Government bids. Also in ordinary exploration drilling there are applications where the bit matrix is not of great importance, and here again the economy in price offered by the cast bit can be utilized.

Some of the large drilling contractors with facilities for making their own bits will use the cast method, because it is easier than the powdered-metal techniques and requires a smaller installation. But such contractors generally buy powdered-metal bits to supplement the others and use them wherever the general drilling is tougher and requires a more abrasion-resistant matrix.

It is significant to Mr. Adamson that the bits being used in oil-field diamond drilling, which has undergone a big development in recent years, are also of the powdered-metal type. In oil drilling the cost of setting is of relatively little importance, in contrast to many cases in drilling for the mining industry.

Larger Mine Cars Aid Mining Cycle. A 5-ton side-dump car, swivel-mounted on two sets of trucks taken from 1-ton cars formerly in service, is being used in combination with Eimco loaders by Teck-Hughes Gold Mines, Ltd., at Kirkland Lake. This substitution has helped smooth out the mining cycle, in respect to the shovel loaders. The larger capacity makes excessive shuttling unnecessary. The two trucks, swiveling at either end, permit the larger car to negotiate sharp turns in the haulageways that originally were driven for 1-ton cars. The car body is all-welded from plate, with old rails for reinforcement. Cost of construction is reported to be low. Lake Shore, adjoining Teck-Hughes, is said to be using a car of similar design.

For Accuracy in Hoisting. Mine hoist design is not static. Ted Wiedenhoefer, manager of Nordberg's mine hoist and process machinery department, points out a new depth indicator as being so accurate that drum marks are not necessary. Because of this accuracy, it is called the Micrometer indicator. It is now standard for all the company's mine hoists, after thorough testing. The indicator is located in front of the operator on the inclined panel of his console, or desk. It consists essentially of two revolving cylinders geared to the hoist drums and has pointers to indicate the position of cage or skip.

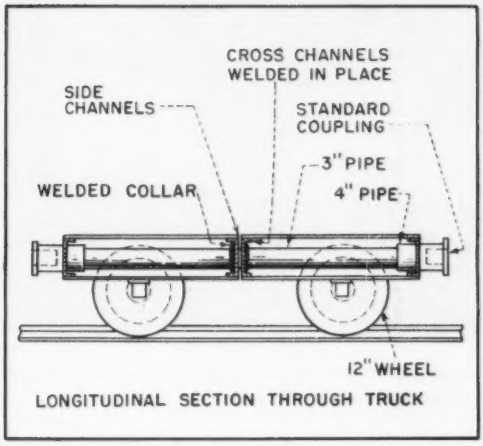
High-Efficiency Drilling Combination. The widely publicized results obtained at Canadian mines in the past 18 months in stoping work with equipment made in Sweden comprising jackhammers mounted on air-feed legs and using carbide-tipped steel have marked this development as outstanding in the mining practice of the period. This circumstance lends more than usual interest to the paper on "High-Efficiency Drilling Combination as Used in Canadian Mining," presented by Messrs. Heaslip and Dawson, of the Canadian Ingersoll-Rand Co. at the recent Mining Congress meeting in Salt Lake City.

These men point out that when air-feed legs in combination with jackhammers were first introduced (10 to 12 years ago), the true value and application of the equipment was not then apparent, due to its inability to function efficiently with steel bits. When the smaller-diameter carbide bits were developed, the possibilities of the jackhammer air-feed leg were again explored. The results indicate that this combination has found a place in Canadian practice. The jackhammer referred to is a standard 45 to 55-lb. drill, fitted for ⅞-in. or 1-in. steel. A survey made by the authors has disclosed the following advantages resulting from the use of this combination:

1. Thirty to 50% increase in footage drilled per shift, where applicable.
2. Fifty percent saving in capital outlay.
3. Appreciable saving in air.
4. No set-up time.
5. Saving in powder due to smaller diameter holes and better distribution.
6. Increase of 20% in available drilling time.
7. Easier to handle lighter equipment—less fatigue for drill runner.
8. Use of longer steel changes.

These savings all add up to give a bigger tonnage broken per man-shift and a lower cost per ton broken. The new system of drilling has possibilities for cutting mining costs, where applicable, and for reducing the physical effort required in breaking rock underground. But, Messrs. Heaslip and Dawson add, they do not expect it to replace stoper drills in steep work such as raises. And, as for tunnel work, its future role cannot yet be evaluated.

OPERATING IDEAS



Modified Timber Truck Holds to Track

Occasional rough sections of track at the Akron property of the Callahan Zinc-Lead Co., White Pine, Colo., caused timber trucks to jump the track until the mechanical department devised a system of cutting truck frames in two, and then re-assembling the sections by means of a 3-in. pipe as shown in the accompanying illustrations. Now front and rear wheel assemblies can hold to weaving sections of track independently, and the problem of track jumping by timber trucks has been virtually eliminated.

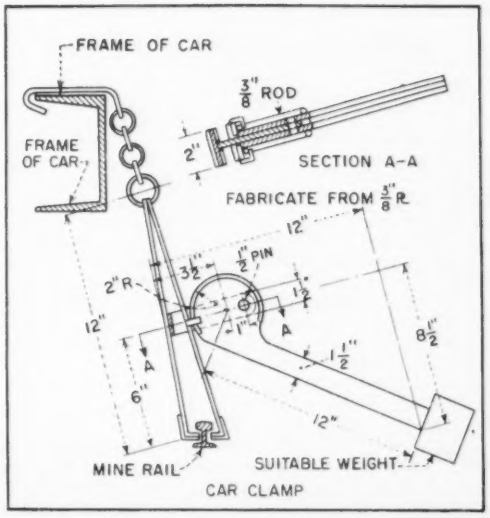
In the accompanying photograph, James Dunn, general superintendent of the Akron Unit, points out the place where the side channels have been severed and the cross channels welded to the side channels. A length of 3-in. pipe is mounted through the center of the truck, passing through holes cut into the end and center cross channels. The couplings are attached to this length of pipe and collars are welded near the end and center channels to hold the assembly together. The result is a truck consisting of two sections which rotate independently but are still held together rigidly to support a load of mine timber.

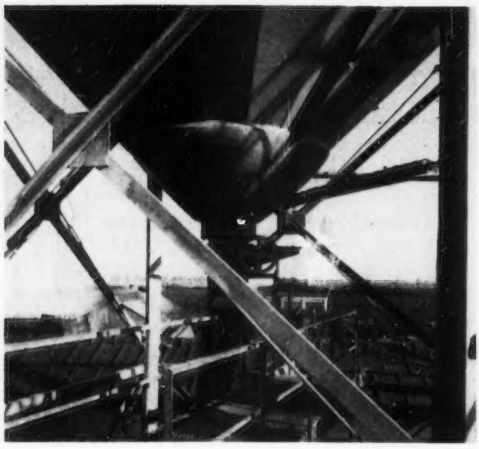
Car Clamp Prevents Mine Cars from Overturning

Nothing aggravates a muck crew more than to have both muck and mine car go over the dump while the car is being dumped. This problem is solved at the Akron operations of Callahan Zinc-Lead Co., White Pine, Colo., by attaching a car holder which clamps the side-dump car frame to the mine rail while the car is being dumped.

The clamp consists of a hook which is attached to the car frame as shown and a set of two L-shaped straps which are clamped to the mine rail by means of an eccentric lever arm with weight attached. Rotation of the weighted arm about a ½-in. pin causes the circular portion of the arm to bear against one of the L-shaped straps, thereby producing the desired clamping action.

Train crews can attach the car clamp in about 10 sec., which is considerably less than the time required to apply chains or other holding devices. Trainmen stand on the clamp lever while they overturn the car body. The unit has been used successfully on 25 and 40-cu.ft. side-dump mine cars.

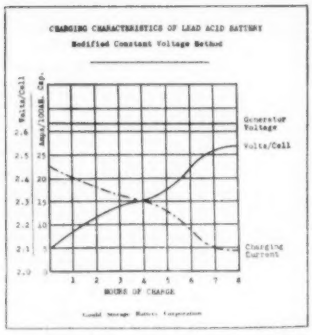




Steam-Heated Hopper Outlet

One way to prevent fine ore, coal, or other materials from freezing in steel hoppers is to encase the outlet tip in a steam-heated insulated jacket as shown here. This jacket was constructed to keep coal flowing out of a hopper of the Stauffer Chemical Co., Niagara Falls, N. Y., during sub-zero weather. Copper tubing was first wound about the lower end of the hopper. Then a 2-in. special blanket of mineral wool was cut to fit around the tubing. These blankets are supplied by mineral-wool manufacturers with a wire-mesh netting on one side and expanded metal lath on the other. A half-inch of mineral wool insulating cement was then trowelled onto the lath. Finally a coat of asphaltic emulsion was applied over the cement.

Steam at 340 deg. F. was then circulated through the copper tubing during cold weather, and thereafter no interruptions in coal feed due to freezing were experienced. Photograph, courtesy Industrial Mineral Wool Institute, New York 17, N. Y.



NEW METHOD involves constant generator voltage and modified charging current.

BATTERY RECORD

Day Operator _____ Night Operator _____ Date _____

Battery Number	Charging										Put in Service			Returned			Remarks:
	Started					Finished											
	Date	Time	Amps	Temp	S.G.	Date	Time	Amps	Temp	S.G.	Date	Time	Truck No.	Date	Time	S.G.	

SYSTEMATIC RECORDS like these will quickly reveal the causes of improper charging and increase battery capacity from 35 to 50%.

How to Charge Storage Batteries With Modified Constant Voltage

K. A. VAUGHAN[1]

Premature storage battery failure is primarily due to improper charging. Industry is currently losing from one-third to one-half its battery capacity due to this factor. And yet battery charging is simple. In fact, it is almost entirely automatic.

Correct charging requires only that dc. current be passed through the battery to restore energy taken from it while performing work. This current is passed through the battery at a rate which will not overheat the battery but will completely charge it within a reasonable length of time, generally 8 hr. Current is passed through the discharged battery at a high starting rate and tapers off to a low finishing rate as the battery becomes charged.

One of the most widely used methods of charging industrial-truck and mine-haulage batteries is the modified constant voltage method which generally employs a constant voltage dc. generator, although a shunt-wound generator can be used when single batteries are to be charged. When the constant voltage generator is used, a ballast register is connected in series with the battery.

At the beginning of the charge, batteries are charged at a high starting rate, the rate depending upon how much the batteries have been discharged. As the battery becomes charged, the charge rate automatically tapers off since the battery voltage rises and approaches that of the generator. Approximately the last 20% of charge is given at a low finish rate—5 amp. per 100 amp.-hr. capacity of the battery. Manufacturers publish recommended finish rates of their batteries. These rates must not be exceeded. If they are, batteries will overheat and hydrogen will be given off from the electrolyte. When the battery is fully charged, automatic controls disconnect it from the charging circuit.

For the lead-acid battery, the bus voltage for an 8-hr. charge should be 2.63 v. per cell. For example, a 15-cell battery requires a 39.5 generator bus voltage. This voltage is a little greater than that theoretically required because it furnishes a more stable charging current.

The ampere capacity of the

[1]Manager, Field Engineering, Gould Storage Battery Corp.

charging generator is determined by the ampere-hour capacity of the battery and the number of batteries to be charged. For each 100 amp.-hr. of battery capacity, the generator should be able to deliver 22.5 amp. Thus, charging equipment to charge a 500 amp.-hr. battery should be able to deliver at least 112.5 amp.

One method of controlling the charge employs the amp.-hr. meter which measures the product of current and time without regard to voltage. In many installations the meter is mounted on the panel board of the charging equipment, each battery having a separate charging panel. It is set to terminate the charge when the amp.-hr. required to bring the battery to full charge have been delivered. To determine the amp.-hr. required, the specific gravity of a pilot cell is taken before putting the battery on charge, and a chart, supplied by the battery manufacturer, is consulted to give the correct meter setting for that type battery at that specific gravity. Once the meter is set, it is not necessary to reset or take any readings except the final specific gravity reading. Another type of amp.-hr. meter is mounted on the body of the battery-powered equipment. It registers as the battery discharges and does not have to be set for charging.

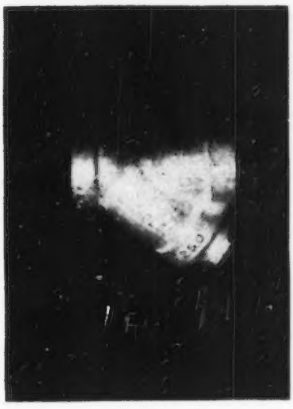
A second method of regulating or controlling the charge is by means of a voltage relay timer. When this method is used, a relay operates a timer when the battery reaches that state of charge at which the battery starts to gas—2.37 v. per cell at 77 deg. The battery is approximately 80 to 85% charged at this point. The timer, which has been preset, automatically terminates the charge at the end of the time period. The timer setting is generally 2.5 to 3 hr., although it will be greater for older batteries. When specific gravity readings taken at the end of the charge indicate the battery is not fully charged, the timer setting should be increased by a period of ½ hr.

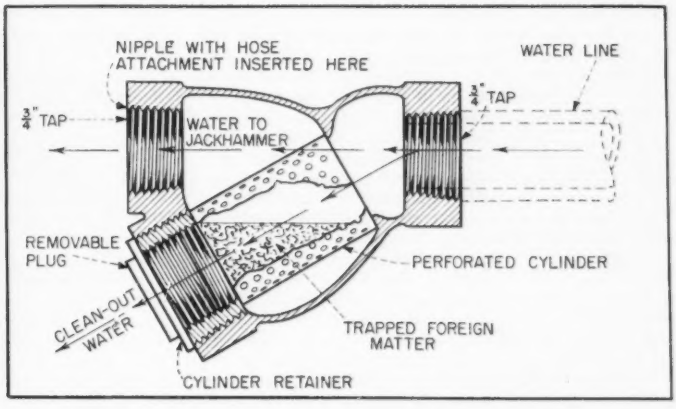
Battery records are of utmost importance. Each battery should be numbered, and when brought in for charging the date, time, vehicle number, battery number, specific gravity of a pilot cell, and temperature of a pilot cell should be recorded. This same information should be recorded when the battery is taken off charge. See record sheet.

Thus, a complete record of the battery characteristics is furnished which will indicate whether the battery is being correctly charged. For example, if the specific gravity is less than 1.260-1.280 at the end of the charge, the battery has been undercharged. If the temperature is above 110 deg. F., the charging rate has been too high. If the records indicate that the battery is being over or undercharged, the reason can be determined readily and corrected.

When records indicate over or undercharging, the battery should be checked to see that all cells are functioning; charging equipment should be checked for correct adjustment, and instruments should be checked for accuracy.

The battery-room foreman should understand storage battery technology and the key points of charging equipment. Some battery manufacturers periodically conduct courses on these subjects to which battery users are invited to send their battery men. Battery manufacturers also maintain field engineering staffs to help solve battery problems.





Water-Line Strainer Prevents Jackhammer Blockage

An easily cleaned trap for removing dirt, scale and other foreign material from water lines leading to wet-drilling equipment is the Nicholson strainer shown here. The fitting is a ¾x¾x1-in. wye containing a perforated cylinder, which permits uninterrupted water flow but prevents passage of any particular matter into the jackhammer. This material drops into the plugged branch of the wye and is washed out of the line by the stream of water when the plug is removed at intervals.

The water hose to the hammer is attached to a short nipple in the water-discharge end of the fitting, thus keeping the strainer as close as possible to the jackhammer. New pipe is added to the line behind the strainer.

Previously used in steam and liquid lines in industrial plants, the strainer has been successfully applied to wet-drilling systems by several coal and metal mining companies. It has been effective in reducing time losses. This item published through courtesy of Coal Age.

WASHINGTON REFLECTIONS

Seabrook Hull, McGraw-Hill Washington News Bureau

Defense Production Act Grants Broad Powers to Control Economy and Stimulate Production

GREATER PRODUCTION of critical materials is a prime objective of the Defense Production Act of 1950.

That means aid and incentives to the mining industry, both at home and abroad. Premium prices for essential production, long-term contracts, Government loans and Government guarantees of regular commercial loans, and Federal participation in mineral exploration and development costs are all possible under the Act.

Here's how the Act reads:

Section 301: "In order to expedite production and deliveries or services under Government contracts, the President may authorize (Government agencies) to guarantee in whole or in part any public or private financing institution . . ., by commitment to purchase, agreement to share losses, or otherwise, against loss of principal or interest. . . ."

Section 302: "To expedite production and deliveries or services . . . the President may make provision for loans . . . to private business enterprises . . . for the expansion of capacity, the development of technological processes, or the production of essential materials, including the exploration, development, and mining of strategic metals and minerals."

Section 303 (a): "To assist in carrying out the objectives of this Act, the President may make provision (1) for the purchase of or commitments to purchase metals, minerals, and other raw materials, including liquid fuels for Government use or for resale; and (2) for the encouragement of exploration, development, and mining of critical and strategic minerals and metals. . . ." Section 303 (b): The President is authorized to buy such materials "without regard to the limitations of existing law, for such quantities, and on such terms and conditions, including advance payments . . . as the President deems necessary. . . ."

Section 303 (c): The President's power includes "The power to transport and store, and have processed and refined, any materials procured under this section."

Section 303 (d): The President is also authorized to "install additional equipment, facilities, and processes, or improvements to plants, factories, and other industrial facilities owned by private persons."

All told, $2 billion is made available for carrying out these sections of the Act.

The language in the Act is general and the powers authorized broad. The result is that even as we go to press, no one is quite certain just who is to do what.

Specifically, the Department of the Interior has been given allocation and priority control over gas, petroleum, solid fuels, and electric power. All other control powers have been delegated to the Department of Commerce, including, so far, mining and metals.

Nevertheless, it's Interior Department's Bureau of Mines job to step up mine production and foster exploration and development. The situation leaves plenty of room for confusion and conflicting authority.

This is not only the place where there is confusion and overlapping authority. Under the Executive Order that followed passage of the Defense Production Act, Interior was specified as the agency deciding where loans and guarantees of loans should be made, and Reconstruction Finance Corporation was designated as the agency actually making the loan. Does this mean that RFC has a veto power over the loan? Or shall such policy decisions rest solely with Interior, RFC being nothing more than a business agent for Interior?

Right now no one knows the answers, but one thing is certain: RFC and Bureau of Mines relationships are going to have to be close and amicable, or the whole program will bog down in a muddle of bickering and buck-passing. Right now officials are cautiously optimistic that everything will work out satisfactorily. RFC will probably have a veto power over the financing arrangements only.

There is much the same kind of situation in the case of incentive purchases—long-term contracts, premium price and advance payments contracts. Bureau of Mines again is supposed to be the policy-making body, and General Services Administration, the agent-buyer. Obviously, also, this activity must be dovetailed with the policies of the Munitions Board in controlling stockpile purchases.

In both the Act and the Executive Order, the Interior Department is directed to "encourage" exploration, development, and mining. But that's as far as either goes. Interior is not sure what is meant by "encourage." Is it simply a morale-boosting "pat-on-the-back," or is it a liberal lending policy? Or does it mean that Government should share in exploration costs and risks? No one has yet supplied the answer. Odds are, however, that it will probably mean all of these.

There will be no "Premium Price Plan," as such. Each request for a loan, loan guarantee, long-term contract, premium price contract, or advance payment contract will be considered on its own individual merits. There is no mandate that all applications must be approved, and all of them won't be.

Applications will be considered on the basis of the urgency of the material in question, not in the order in which applications are filed.

Don't go to Washington to make application. All these matters will be handled by the Bureau of Mines or Geological Survey Office in the eight district field office headquarters of the Bureau of Mines at Juneau, Alaska; Albany, Ore.; San Francisco, Calif.; Denver, Colo.; Minneapolis, Minn.; Amarillo, Tex.; Tuscaloosa, Ala., and Pittsburgh, Pa

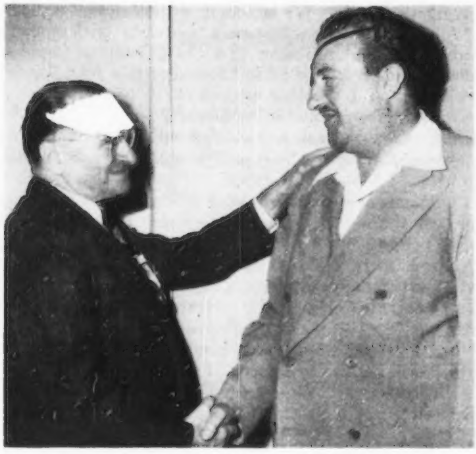
Once the applications are in, Bureau of Mines will determine the order of urgency based primarily on military needs. It will base its decisions on criteria set forth by the Munitions Board.

Applications will be coming in from both the U. S. and foreign countries. Both foreign and domestic producers will share in the program. Foreign applications will be handled in Washington.

(*Continued on page* 106)

LABOR THIS MONTH

Joseph M. Gambatese, McGraw-Hill Washington News-Bureau



JOHN CLARK, president, and MAURICE TRAVIS, secretary, of Mine-Mill and former member of the Communist Party.

Mine-Mill Denver Convention Promises Mutual Aid for Ousted Left-Wing Unions

MINE, MILL AND SMELTER WORKERS' 46th convention at Denver opened a new chapter in the union's 57-year history. It was Mine-Mill's first convention since expulsion from the CIO last winter.

In 1897, the union, then known as the Western Federation of Miners, pulled out of the AFL because it was too conservative, and didn't return until 1911.

What Mine-Mill's next affiliation might be is not clear yet. The convention authorized "a program of mutual aid and cooperation" with other left-wing unions kicked out of CIO, but stressed that there was no intention to form a third labor federation. However, the Communist Party line, usually followed by Mine-Mill, calls for such a federation. The planned merger of left-wing office, food and distribution workers could be the beginning of one.

On foreign policy, the convention again attacked the Marshall Plan and accused "reactionary interests" of using the Korean war "as a device to split and smash this union."

On Korea, the convention followed what is believed to be the new Communist Party line. It called for "peace" in two steps:

1. Termination of the Korean war by mediation through a "truly representative" body of the United Nations, and 2. Negotiations between the United States and Russia to outlaw the atom and hydrogen bombs.

Some 250 delegates met the week of September 11. President John Clark called attention to the fact that the delegation was larger than the one at last year's convention at Chicago. However, claimed membership of 90,000 was 10,000 less than last year's claim.

Financially, Mine-Mill operated in the black the past year by cutting expenses $154,000. Income exceeded expenses by $5,000, leaving total assets of $81,600 with $52,600 of it in cash. In the previous year, the union operated at a loss of $49,000.

A referendum will be submitted to the members to raise monthly per capita tax from 80 to 90 c. A proposal to raise it to $1 was voted down last year.

An increased per capita levy was deemed necessary to carry on Mine-Mill's struggle against three CIO unions—steel, auto and chemical workers—as well as mining employers.

COMMUNISTS IN U. S.: As a practical matter, the McCarran Internal Security Act may have little effect on your employee relations. It works this way:

First, you must have a Government contract.

Then the Defense Department must list your mine or plant as a defense facility at which it wants to use the law. If it does, you will get a notice to post in your employment office.

When that happens, Communists and members of Communist "fronts" violate the law if they apply for, or accept, a job without disclosing their subversive connections.

Communists violate the law further if they take a job in a defense facility on the Defense Department list.

The matter is one strictly between the employee and the Federal Government. As an employer, you do not violate the law if you hire one of these persons.

IN SWEDEN: Communist strength, concentrated in iron mines of far north, is reported declining in Swedish trade unions.

MANPOWER: List of 72 essential activities is being cut, but mining will stay on it. Definition may be revised to include smelting. Also, mining jobs will be added to list of critical jobs, and mining equipment manufacturing may be added to essential activities.

DEFERMENTS: Up to now, list of critical jobs in essential activities is being used by Defense Department as a guide in delaying calls of Reservists and National Guardsmen. Manpower planners hope to get Selective Service to use it for draft deferments, too. They want to avoid what happened in last war: copper miners were drafted, then had to be brought back.

LONGER WEEK: It's one way to get more production out of available workers. American Mining Congress urges Congress to lift 40-hour-week law to spur it. Many metal mines already were working more than 40 hours in July. BLS figures show average week worked in metal mining was 41.6 hours. Year before it was 39.4 hours.

WAGES: They're up, and going higher. Average straight-time hourly earnings in metal mining was $1.54 in July. Year before it was $1.49. Mine-Mill convention went on record for "substantial wage increases," but mentioned no figure. What Phil Murray does in steel may affect mining wages. A 10c. pattern has developed since Korea. Alcoa volunteered a 10% increase.

CONGRESS: Senator Taft is in trouble in Ohio but should get re-elected by close vote. Even his defeat wouldn't help fair dealers repeal the Taft-Hartley labor law. They have to pick up at least five anti-Taft-Hartley votes in the Senate. Instead, they have lost four votes through primary defeats of Graham, Pepper, Thomas (Oklahoma), and Taylor.

DENHAM: Truman knew Taft-Hartley had no chance of repeal when he asked Robert N. Denham to resign as NLRB general counsel. You can expect his successor to go easier on the unions.

Defense Budget Zooms to $50 Billion Annually

MUNITIONS BOARD'S more aggressive stockpiling policy—to buy as much as possible as soon as possible with less regard to cost—got a big boost when Congress passed the $17.1-billion supplemental appropriations bill. It added $598 million more for stockpile buying this year. It brings the total for the current fiscal year up to $1.2 billion.

It's now possible to chart—roughly—the speed and acceleration of industrial mobilization. It's an indication of what industry's demands for hard-goods raw materials will be over the next two or three years.

This year's military budget will top $40 billion before it's through. Appropriations for military arms aid, plus regular and supplemental Defense Department requests already total more than $30 billion. That's twice as big as the budget request before Korea, but it's only a starter.

The forecast military budget during the prolonged buildup period now tops the $50 billion per year mark. There are some in official Washington who say it will have to be even bigger. The $50 billion is a minimum, whether present efforts for a quick end to the Korean warfare are successful or not.

Roughly half of this money goes for hard goods to be purchased from industry. It means a strain on the economy that will be felt by everyone. It also means that requirements for mineral raw materials will be greatly expanded for at least a three-year period.

All hard-goods procurement contracts with money from the regular budget and the $17-billion supplemental budget will be let by the end of this year. There will be only a few minor exceptions.

In December probably, by January for sure, the Administration will ask for another military supplement appropriation request. It will be anywhere from six to fifteen billion dollars more.

That means orders will keep going out for the balance of the fiscal year until the fiscal 1952 budget is appropriated.

Expenditures, actual cash outlays by Government, will lag behind orders necessarily. This is because the Government rarely pays for anything in advance. However, by next June expenditures are expected to be running around $3 billion a month, some $2 billion of which will be for hard goods. Peak of expenditures as now foreseen will come around June, 1952, when they are expected to reach at least $5 billion a month. Dollars paid out for hard goods being delivered are expected to compose at least two-thirds of peak expenditures.

All this assumes there will be no major war and not too many "police actions" like that now taking place in Korea. Otherwise figures will be higher.

Export Controls Will Be Tightened Soon

MORE EVIDENCE of tightening up on export controls will soon appear. The Administration now has four good reasons for wanting a closer look at what we sell abroad:

1. To limit sales abroad of goods in short supply here.
2. To direct necessary supplies to foreign strategic development programs.
3. To assure continuity of western European recovery and point-4 world development activities.
4. To prevent war-making materials from reaching Iron Curtain countries.

Odds Favor No Action on Copper Duty Waiver

IT STILL CAN'T be firmly predicted whether or not Congress will pass a copper-tariff suspension bill this year. Congress didn't go home for good, but just recessed for electioneering. Thus, it still may take action when it returns in late November.

Pressure for suspending the tariff has softened considerably since last spring when it was an Administration "must." At that time it was considered important to our relations with Chile that we shouldn't hurt her copper export market and dollar earnings.

Now, however, things are different. Tariff or no tariff, the U. S. is going to buy all the copper it can get from any sources. This assures a continuing strong market for the Chilean output, and a price that, even with tariff subtracted, is far above production costs.

However, this doesn't mean that further efforts won't be made to ram through a duty-suspension bill this session.

H. R. 5327, the bill extending the scrap metal import duty suspension, passed just before Congress recessed, is effective through June, 1951, from the date of enactment.

Tungsten and Antimony Duty Raises Expected

WITHDRAWAL OF CHINA from the present Geneva Agreement means higher tariffs on tungsten and antimony 30 days after the President gets around to announcing China's withdrawal officially. The present 38c. per lb. (metallic tungsten content) duty on tungsten ore and concentrates will revert to the old rate of 50c. per lb. Duty on regulus, or metallic antimony, will be doubled from 1c. a pound now to 2c. The ¼ cent-a-pound on needle or liquated antimony will remain unaffected.

Small Comfort for Mining in Stop-Gap Tax Law

CONGRESSIONAL TAX-WRITERS are already working on next year's tax bill, a bill that's going to be a lot tougher than the $4.7-billion stop-gap law passed last month, which raises corporate rates to 45% and individual taxes 9 to 17%, beginning Oct. 1, 1950.

The final measure washed out the additions to the percentage depletion list which the House had written into the bill. However, Congress did hold the line against the Administration attack on percentage depletion, and also added that transportation of ore from mine to mill up to 50 miles (or farther, at the Treasury's discretion) shall be regarded as "mining" for purposes of computing percentage depletion. The effective period for this provision began Jan. 1, 1950.

Tax benefits of a more general nature include the right to carry losses and gains forward five years and back one year (formerly, forward three and back two). Also, the cost of new certified "defense facilities" can be deducted from taxable income up to a rate of 20% annually—in effect an accelerated depreciation provision, except that profits from ultimate sale will be treated as income rather than capital gain.

MARKETS—Trends and Prices (*Continued from page* 69)

Manganese Ore Imports

(Bureau of the Census)

General imports of manganese ore (35% Mn or more) into the United States in the first half of 1950, in short tons:

Source:	Battery Grade — Gross Weight	Battery Grade — Manganese Content	Other — Gross Weight	Other — Manganese Content	Totals — Gross Weight	Totals — Manganese Content
Angola	.....	.....	8,152	4,291	8,152	4,291
Belgian Congo	.....	.....	5,324	2,585	5,324	2,585
Brazil	5,987	2,535	57,969	26,271	63,956	28,805
Chile	.....	.....	6,332	2,988	6,332	2,988
Cuba	5,899	2,843	40,075	18,118	45,974	20,961
French Morocco	1,646	911	16,934	8,641	18,580	9,552
Greece	.....	.....	440	178	440	178
Gold Coast	30,787	16,973	114,303	55,538	145,090	72,511
India	10,949	5,042	303,810	144,879	314,759	149,921
Mexico	66	29	9,274	4,110	9,340	4,139
Philippines	.....	.....	4,098	1,749	4,098	1,749
Turkey	.....	.....	1,075	473	1,075	473
South Africa	6,909	3,451	242,690	105,742	249 599	109,193
U. S. S. R.	.....	.....	16,107	7,834	16,107	7,834
Totals	62,243	31,784	826,583	383,397	888,826	415,181

Note: General imports comprises ore received at United States ports, part of which went into immediate consumption and the remainder was entered in bond.

Official London Prices

The British Ministry of Supply continues to fix delivered prices of copper, lead and zinc for the United Kingdom. Quotations in effect as September ended were as follows:

	Per Long Ton £	s.	d.
COPPER			
Electrolytic, high conductivity	202	0	0
Fire refined, high conductivity	202	0	0
Fire refined, high grade	201	10	0
Fire refined, min. 99.7 percent	201	0	0
Fire refined, min. 99.2 percent	200	10	0
LEAD:			
Soft, foreign duty paid	128	0	0
Soft, Empire	128	0	0
English, refined	129	10	0
ZINC:			
Foreign (G.o.b.) duty paid	147	10	0
Domestic (G.o.b.) duty paid	147	10	0
Prime Western and debased	147	10	0
Refined and electrolytic	152	0	0
Minimum 99.99 percent	158	0	0

Miscellaneous Metals, Ores, Minerals

Quotations cover wholesale lots, prompt shipment, f.o.b. New York unless otherwise stated

MISCELLANEOUS METALS

September 30, 1950

Aluminum, ingot, 99 plus percent, lb. (base price)	19c.
Antimony, spot, lb., 5 tons and up but less than carload in cases	35.280
Bismuth, ton lots, lb.	$2.25
Cadmium, commercial sticks, delivered, lb.	$2.40
Calcium, 1 lb., ton lots, 98 percent, cast	$2.05
Chromium, 97 percent grade, lb., contract	$1.67
Cobalt, 97 to 99 percent, per lb.	$1.80
Indium, troy oz.	$2.25
Nickel, cathodes, lb., f.o.b. Port Colborne (a)	48c.
Magnesium, 99.8 percent, carloads, lb., producer's plant, Freeport, Texas	22½c.
Palladium, troy oz.	$24.00
Platinum (Official quotation wholesale lots) troy oz.	$100.00
Quicksilver, flask of 76 lbs., 25 flasks or more	$87.00
Selenium, 99.5 percent, lb.	$2.25
Silicon, minimum 97 percent, spot, carloads, lb.	16.50c.
Tellurium, lb.	$1.75 nom.
Thallium, 100 lb. or more, lb.	$12.50
Titanium, 96 to 98 percent, lb.	$5.00

(a) Includes U. S. duty

METALLIC ORES

Beryllium Ore, imported, 10 to 12% BeO, per unit	$26.00
Chrome Ore, per long ton, f.o.b. cars Atl. ports, dry 45% Cr_2O_3, no ratio	$17.30@$18.50
48% Cr_2O_3, 3 to 1 ratio	$35.00@$41.00
Iron Ore, Lake Superior, Lower Lake ports, long ton:	
Old Range bessemer	$8.10
Mesabi bessemer	$7.85
Mesabi, non-bessemer	$7.70
Lead (Galena), 80 percent, Joplin, Mo., ton	$205.27
Manganese Ore—Per long ton unit of Mn basis 48 percent manganese, nearby positions, subject to premiums and penalties, 74 @ 80c., c.i.f. U. S. ports, duty extra. Long-term contract prices nominal.	
Molybdenum Ore, 90%, per lb. of MoS_2 f.o.b. mines	54c.
Tantalite, 60% concentrate, per lb.	$2.00@$2.75
Tungsten Ore, per unit of WO_3	
Foreign, 60 percent, duty paid	$24.00@$24.50
Domestic, scheelite, 60 percent and upward	$26.00
Vanadium Ore, per lb. of contained V_2O_5 f.o.b. mines	27½c.
Zinc Ore, Prime, 60 percent concentrate, Joplin, Mo. per ton	$115.00

METALLIC COMPOUNDS

Arsenious Oxide (arsenic trioxide) lb., in bbl carload lots delivered	6c.
Cobalt Oxide, 72%, metallurgical grade, per lb. of Co	$1.95
Copper Sulphate, 100 lb.	$8.65

ALLOYS

Beryllium Copper, 4 percent Be, per lb. of contained Be, 5 lb. or more of Be	$30.00
Ferrochrome, 65 to 69 percent, per lb. of Cr contained	20.50c.
Ferromanganese, 78 to 82 percent, gross ton, seaboard	$172.00
Ferromolybdenum, 55 to 65 percent Mo, lb. of Mo, contained	$1.13
Ferrosilicon, 50 percent, per lb. of contained Si	11.3c.
Ferrotungsten, 75 to 80 percent, lb. of W contained	$2.25
Ferrovanadium, per lb. of V delivered	$2.90
Silicomanganese, 1½ percent 7, per lb. contracts	8.95c.
Spiegeleisen, per long ton, 19@21%	$70.00

NON-METALLIC MINERALS

Asbestos, f.o.b. Canada (Quebec) mines (U. S. funds), ton:	
Barytes, f.o.b. mines:	
Crude No. 1	$960@$1,050
Crude No. 2	$492@$550
Spinning fibers	$232@$475
Shingle fibers	$95.50@$141
Paper stock	$78.50@$88
Waste	$58
Shorts	$27@$52
Vermont, f.o.b. Hyde Park:	
Shingle stock	$97.00@$107.00
Paper stock	$68.50@$85.00
Waste	$51.00
Refuse or shorts	$25.50@$46.50
Barytes, f.o.b. mines:	
Georgia, crude, per long ton	$13.00@$13.50
Missouri, 93 to 94 percent $BaSO_4$, per short ton	$9.00@$9.50
Bauxite, long ton, f.o.b. point of shipment:	
Domestic, crude, 50 to 52 percent (not dried)	$4.50@$5.50
Domestic, chemical, 55 to 58 percent	(a)$8.50@$9.50
Domestic, abrasive, 80 to 84 percent	$18.00@$18.50
China Clay, f.o.b. mines, ton:	
South Carolina and Georgia, No. 1 airfloated bulk	$8.50@$9.50
North Carolina ceramic grade	$20.25@$22.25
Feldspar, bulk ton:	
Potash or soda feldspar, 200 mesh, ceramic grade	$18.50@$22.25
Glass par, white, 20 mesh	$11.75@$12.50
Fluorspar, f.o.b. mines, bulk, Kentucky and Illinois, 76% effective, CaF_2, ton	$39.00
Acid 97% concentrate, bulk, ton	$43.50
Fuller's earth, f.o.b. Georgia or Florida, ton	$7.00@$14.00
Magnesite, per ton dead-burned, bulk, f.o.b. Washington	$33.00
Mica—Domestic, f.o.b. mines, Punch, 12 to 22c. per lb. according to size and quality. Sheet, clear, 1½ x 2 inch, 70 to 75c.; 2 x 2 inch, $1.10 to $1.20; 2 x 3 inch, $1.40@$1.50; 3 x 3 inch, $1.70@$1.80; 3 x 4 inch, $2.10; 3 x 5 inch, $2.40; 4 x 6 inch, $3.15; 6 x 8 inch, $4.25. Wet ground, very fine, $120@$130 per ton. Bulk sales, dry ground, $32.50@$60.00 per ton. Scrap, $36 and up.	
Ocher, Georgia, ton, in sacks	$24.00
Pyrites, Spanish, per long ton unit of S, c.i.f. Atlantic ports	(a)12@14c
Sulphur, Texas, mines, long ton	$18.00
Talc, f.o.b. works, ton:	
New York, purified	$18.50@$20.00
Vermont, extra white	$12.50
Tripoli, Missouri, ton:	
40 mesh, cream colored	$30.00

(a) Nominal

IRON AND STEEL

Pig iron, gross ton, basic, Valley furnaces	$46.00
Steel, f.o.b. Pittsburgh billets, net ton	$53.00
Structural shapes, 100 lb.	$3.40

DIAMOND DRILLS put in holes on either side of the lode seam. The narrow veins occur in fissures in granite and nearby metamorphosed rocks.

THIS BLACK POWDER is a 70% tin concentrate from the flotation machines and buddlers. It is loaded into 100-lb. sacks for shipment to the smelter.

GREEVOR TIN MINE employs 300 men and women (150 underground) to hoist about 50,000 tons of rock per year. The 1,500-ft. deep workings cover about 500 acres.

Ancient Cornwall is Pinched Now But Sees Good Future

ONLY 75 YEARS AGO, Cornwall mines were the world's leading source of tin. In 1948, they produced less than 1% of the world's output. This decline is a dramatic illustration of what happens when expensive lode mining using high cost labor, competes with alluvial operations and cheap labor.

But the Cornwall lodes, mined since pre-historic times, have a definite and important stake in the future. When the rich alluvial deposits of the Far East are worked out (the estimate is 20 more years of activity) and if no new discoveries are made (there have been none for 30 years), large reported reserves should make Cornish mining active again.

Two mines, the Greevor and South Crofty, are currently operating in Cornwall with an output of about 800 tons of tin per year. Mineralized areas occur in the granite, or on the margins of the granite, or in nearby metamorphosed sedimentaries. Nearly all the tin ore in Cornwall occurs in lodes in the infillings of fissures in the granite and adjacent sedimentaries.

Minerals seem to be distributed vertically in the tin fields with some regularity. Geologists believe that this distribution is related to temperatures and pressures of formation. Minerals, like tinstone, with the highest temperature of formation occur toward the bottom of the metalliferous zones. Various sulphides are found above the zone of oxide of tin.

Changes in World Production of Tin

(Metal content of ores mined in long tons)

	1865	1913	1948
Cornwall	10,039	5,288	1 281
Malaya	6,000	51 377	44 815
Indonesia	5 281	20,921	30,562
Thailand	2,000	6,748	4 240
China	500	8,257	4 800
Australia	130	7 780	1 874
Bolivia	100	25,939	37 336
Nigeria	Nil	3,872	9 237
Belgian Congo	Nil	6	14,073
Other countries	150	3,612	5,982
Totals	24,200	133,800	153,200

IN MINING

IN THE UNITED STATES

- Work Starts on Arizona Manganese Deposit—P. 109
- Mining Congress Meets at Salt Lake—P. 110
- New Park Acquires Uranium Claims—P. 129

ALASKA

★**Gilbert Martin and associates employed a five-man crew** this summer on two 10-hr. shifts 7 days a week sluicing with water lifted 200 ft. at their property on the divide between Buckeye Creek and Tenderfoot Creek in the Richardson area. The pay dirt which Mr. Martin says is found just under the brush and moss varies in depth from 13 to 40 ft.

★**The 2,100-ton No. 2 dredge of the F. E.** operations of U.S. Smelting Refining & Mining Co., which was divided into four sections last fall by blow torches and moved this year from Goldstream over 20 miles of snow-packed roads to Fairbanks Creek, has been riveted together again by a 50-man crew. Sleds for carrying 150 tons were designed by Boris Ashurkoff, one of the company's mechanical engineers. Gas burners were fitted inside the 12-ft. shoes about 6 in. apart. The dredge which was purchased in 1928 for $750,000 is now reported to be worth 1½ million.

★Paul Sorenson, manager of Hirst-Chichagof gold mine which has been idle for seven years, reported that **operations would be at full scale** this winter at the property on Kimsham cove. George Meagher of Seattle is president.

★It is reported from Kotzebue that **gold has been discovered in the Selawik River district.** Claims have been staked and Ted Davis of Fairbanks together with a number of Selawik men are prospecting. John Olsen of Selawik is credited with the discovery. One-fourth ounce of gold is reported to have been taken from Elmer Ballot's claim in three pans at a depth of 3 ft.

★Ed Bjornsgaard's Collinsville mine is reported to be the largest of **14 placer mine operations which were active** in the Cache Creek and Yentna districts this summer.

ARIZONA

★**Arizona's large copper producers are operating at maximum production rates.** Small mines which produced nearly 20% of World War II peak output still are idle, though, because of operating costs and uncertain market conditions.

Phelps Dodge properties have been on a maximum schedule since before the Korean crisis. Open-pit operations are running continuously except for two-day repair shutdowns each month. Some underground properties are working seven-day schedules, too. These include Kennecott's operations at Ray and the Hayden smelter of the American Smelting and Refining Co. Mines in the Globe-Miami district are working six-day schedules.

★**Work has been resumed at the Coronado mine** in Cochise County. The shaft operation has been shut down for several years. Ninety men are employed in the copper workings.

★**The Artillery Peak manganese deposit** is in Mohave County, lying roughly in a "U" about 7 mi. long and 3 mi. wide with its base at the north bank of the Bill Williams River.

The orebody is fairly flat. Bureau of Mines engineers and about 40 men have been working at the site. Laboratory material and milling equipment has been brought in from Boulder City, Nev.

One 1,400-ft. tunnel has already been driven into the orebody and three more, between 1,500 and 2,500 ft. are planned in order to get representative samples.

Existence of the ore deposit has been known since before World War I. Some 41% manganese ore was mined during World War I. The deposit runs about 16% manganese, although some sections assay as high as 48%.

The Bureau of Mines says this is probably the largest manganese body on the North American continent.

Purpose of the pilot plant will be to find a way to concentrate the ore to 40% or better manganese and make it acceptable for commercial use.

The State Highway Department is spending $1,405,000 in the area this year for roads and bridges. Some of this was previously allocated, some expedited to provide roads for mining crews and material.

CALIFORNIA

★**Coronado Copper & Zinc Co. of Los Angeles has resumed operation** of the Afterthought copper-zinc mine at Ingot, 25 miles northeast of Redding. The mine had been inactive for about a year. Ore deposits in the Afterthought are reported to have averaged about 18% zinc, 2% copper and 2% lead to the ton, with gold and silver values also.

★A leading producer in the Mother Lode, **Central Eureka Mining Co. plans to sink a winze** from the 3,900-ft. level of its shaft to develop the main ledge at a 4,200-ft. depth. Central Eureka is milling 150 tons of gold ore daily, averaging about $17 a ton.

★Diamond drilling at Big Boulder and Monarch gold mines near Downieville is scheduled. The Big Boulder group of lode and placer claims leased a few months ago by Security Gold Mining Co., covers 500 acres in the Gold Valley region. William E. Ennis is manager of both properties.

★**Several old producers in Sierra County are being rehabilitated** in the Alleghany, Downieville and Sierra City areas. More than 30 properties are active in Sierra County. At Alleghany the famed Sixteen-to-One mine is reported operating at 60% of normal capacity, with 40 men employed. Gold Crown Mining Corp. is rehabilitating the Wonder property in the Alleghany district. Ernest Gastonguay and Otto Rasmussen are in-

High Tariffs, Hard Money, Better Tax Climate Backed Strongly At AMC Salt Lake Meeting

EMBELLISHED BY THE GREATEST METAL MINE equipment show in history, the annual convention of the Western Division of the American Mining Congress, held in Salt Lake City, August 28 to 31, attracted a record crowd of more than 5,400. A four-day comprehensive agenda of dual sessions in operating and economic-political subjects was well attended.

In the political-economic field, papers and discussion reiterated the traditional attitudes of: discontent with the state of the industry and Government policy affecting mining; espousal of redeemable currency; advocacy of tariff protection and national self-sufficiency; resistance to Governmental favoritism toward labor organizations; opposition to modification of public land policy; and sponsorship of special tax incentives to mine investment.

In an atmosphere of higher metal prices, the postwar controversy over subsidies seemed to have resolved into a general antipathy toward the Government controls inherent in subsidies.

Simon D. Strauss, American Smelting & Refining Co., gave a clear picture of the "Outlook for Non-ferrous Metals and for Silver," pointing out that for the foreseeable future, demands for non-ferrous metals will be strong and markets bullish. He expects continuation of the *status quo* in silver.

Paul H. Hunt, Park Utah Consolidated Mines, asserted that domestic mining has suffered from neglect for several years, and that changes in Government policy or the price structure will be necessary. He advocated improved tax policies and tariff protection. He was joined in this by Paul Jessup, Day Mines, Inc.

C. Girard Davidson, Assistant Secretary of Interior, speaking on "Proposals for Changes in the Mining Laws," called attention to the many sources of dissatisfaction with the present law and pledged the cooperation of the Interior Department in working out changes. He stated unequivocally that the Department has no intention of trying to substitute a leasing system for the present claim-by-discovery method insofar as hard rock mining is concerned. However, industry speakers expressed reluctance to proceed with modifications on the ground that the problems were not serious enough to warrant distraction from production tasks during an emergency.

Charles M. Hackett, E. I. duPont de Nemours & Co., portrayed convincingly the need for education of average citizens and employees on business problems, pointing out that the public in general is not sold on business viewpoint. James E. Hogle, Rico-Argentine Mining Co., emphasized the desirability of fact-giving company reports and education of corporation stockholders to the needs of industry.

Mining Sessions

Emphasis in the mining sessions was on increased output and cost reduction. For example, John G. Hall, Chief Consolidated Mining Co., described the 51 separate incentive plans now in effect at his property. Under these plans, employees' earnings have averaged about 40% above basic wage and unit costs have been reduced.

Centralized timber handling has saved time and money for the mines on the Butte Hill, according to a paper ably presented by T. S. Veazey, Jr., Anaconda Copper Mining Co. The conversion from steam to diesel-electric haulage at the Ruth Pit cut labor cost 25%, fuel cost 60%, and maintenance costs 50%, according to Paul Hett, Kennecott Copper Corp.

On the drilling side, J. Fred Johnson, discussing rock breaking, reported that a hydraulic rotary drill, backed by a 25-hp. high pressure pump, drilled 8 fpm. in ground where a 4-in. drifter, backed by a 75-hp. compressor, drilled only 2 fpm. He looked for greater use of new lighter and faster drilling tools. J. C. Heaslip, Canadian Ingersoll-Rand, told of the possible advantages of light jackhammers combined with air feed legs and carbide-tipped bits. These include: a possible saving of 50% in capital outlay, increase of up to 50% in footage drilled per shift, increase of up to 20% in available drilling time.

J. M. Ehrhorn, U. S. S. R. & M. Co., pointed out recent improvements in blasting practice through: 1, better safety rules; 2, increased use of ammonium nitrate and semi-gelatine powders; 3, packaging of explosives in smaller quantities for underground use and in larger quantities for pit use; 4, primacord, with or without spacing; 5, short-period delay caps; 6, ignitacord and connectors; 7, positive spitting devices and better stemming.

Milling Sessions

In the milling sessions, a symposuim on rod mill liners brought out an apparent agreement that one of the major factors in liner wear is badly-fitting liner plates, lifter bars, and liner bolts. Both Homestake, reported by C. E. Schmidt, and Midvale, reported by R. A. Pallanch, feel that most improvement in liner performance will come through better fitting of these parts.

However, both Bradley Mining Co., reported by J. R. Clarkson, and Anaconda, reported by C. F. Milkwick, found that liner type was extremely important. Original wave-type liners in each plant wore out after 100,000 tons. Alloy liners with lifter bars, in each plant, have lasted well over 350,000 tons. J. F. Myers, Tennessee Copper, gets excellent performance by grooving the liner plates lengthwise as a kind of lifter bar in reverse.

Much interest was shown in a report on the double-impeller dual-impact breaker, as described by A. C. Ensign, Galigher Co. It has made startling size reductions at high capacity, where applicable, and studies of new alloy materials for its hammers are expected to widen its range of usefulness.

A. W. Fahrenwald, University of Idaho, described an interesting new grinding technique using a ball mill that revolves as it rotates, permitting a greater energy input, and apparently doing more work. His tests are still at an early stage, but show good comparisons with standard grinding procedure.

Acid scouring and desliming will be necessary to treat the oxidized ore from the Greater Butte Project, according to F. F. Frick, Anaconda Copper Mining Co. Soluble copper will be recovered by sponge iron treatment, and sulphide copper will get the lime-xanthate float now being used.

In a special session of the AIME Minerals Beneficiation Division B. S. Crocker, Lake Shore, reported on some impressive savings made by converting Lake Shore to pebble mill grinding. Country rock is used, crushed and sized at the mine; it is fed to each mill in accurately weighed amounts, and costs have been cut as much as 26%.

Atomic Energy

In a session on atomic energy, Jesse C. Johnson, AEC manager of raw materials operations, assured domestic uranium producers of a market until March 31, 1958, at least. He outlined minimum prices and other policies for purchase of uranium ores, and said that Circular No. 5 governing purchase of Colorado ores will also be extended until 1958.

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CALIFORNIA *(Continued)*

stalling a dredge on their Pride placer holdings at the junction of Deer and Williams Creek above Sierra City. Holdings consist of 16 placer and lode claims about 3 miles from Sierra City.

★**Fairview Placers is recovering 800 to 1,000 oz. of gold monthly** by dredge near Minersville. The dredge handles 7,000 cu. yd. of gravel daily and is capable of digging to a depth of 35 ft. below the water line.

★**Siskiyou County lode and placer gold properties are active,** with more than $500,000 produced last year from the area. Yuba Consolidated Gold Fields operates a powerful dredger in the Seiad area, and Reeves Ranch Dredging handles about 5,000 cu. yd. of material daily near Happy Camp.

★Madrona Mining Co. of Pasadena is developing the old Kentucky Flat gravel channel on the John Shields property at Volcanoville.

★Twenty placer mines in Trinity County **produced gold valued at $110,460** last year, for the most part recovered by dredges and hydraulic equipment.

★The old barite mining district near El Portal, Mariposa County, Calif., has yielded **a new barite orebody,** which was discovered during diamond drilling operations carried on last winter. Baroid Sales Division of National Lead Co. is the operator of the El Portal mines, which have produced barite and witherite intermittently for more than 70 years. Recent development work at El Portal includes driving of a crosscut and raise on the orebody.

★In the Marble Springs mine, Mariposa County, **mining is progressing** on the 400-ft. level with eight men employed. Values occur both as free gold and in gold-bearing pyrite in a quartz gangue. C. Glenn and Arthur Steintorf are the present lessees and R. Jergentz is superintendent.

★The Howie drift mine, on the old Snowpoint mine property in northern Nevada County, Calif., **began washing operations early in June.** A vertical two-compartment shaft has been sunk to bedrock at a depth of 230 ft. and about 400 ft. of drift excavated. With 12 men employed, an output of about 100 cu. yd. per day is expected in the near future. Robert Hodge is president and Ross Prout general manager of the company.

COLORADO

★Regardless of possible wartime restrictions on steel and building materials, completion of the **Golden Cycle Corp.'s** new Carlton mill in the Cripple Creek district, together with full equipment is assured, according to Max Bowen, Golden Cycle's vice president and manager. The building is completed and most of the machinery is on hand or set up.

★The old **Ling gold mine** on North Star Mountain near Hoosier Pass has been cleared of years of litigation and is now being opened for mechanized operation by Cordillera Corp. Machinery is being installed. Sid Gately is manager.

★At Cripple Creek, Jesse Simmons of Denver, president of the Champion Mines Co., reported that **gold ore worth $210 per ton has been found** in the 11th level of the WPH mine on Ironclad hill. The Champion company leased the property and deepened the mine shaft in recent months.

★**Treasure Mountain Gold Mining Co.** is driving a drift at its property in Picayune Gulch, on the Scotia Lode that will eventually get under the gold area of the Golden Fleece vein. Sulphide ore of good grade is being followed in the drift.

★Quit-claim deeds have been filed transferring 141 uranium-vanadium claims on the Colorado Plateau from the ownership of the Minerals Engineering Co. to the **Climax Uranium Co.,** a Delaware corporation. Revenue stamps attached to the conveyances indicate that the purchase price was in the neighborhood of $25,000. The Mineral Engineering Co. is merging its holdings with the Climax Uranium Co., an affiliate of the Climax Molybdenum interests, and has started erection of a uranium-vanadium mill at Grand Junction. Blair Burwell will become general manager of Climax Uranium, it is reported.

★The Whitepine mining operation of **Callahan Zinc-Lead Co.,** near Gunnison, is being geared up for a war effort production. The mine has been operated with limited personnel during the past few months due to drops in the prices of both lead and zinc.

★**Uranium ore has been found in Oil Creek Canyon** 15 miles east of Pagosa Springs by three men who were prospecting for gold and silver. C. B. Jenkins said he, John R. Ellis and Fred G. White made the discovery near Squaretop Mountain and have filed on five parcels of land. They will ship to the Vanadium Corp. plant in Durango.

★A cost-plus contract has been awarded the Utah Construction Co. of Salt Lake City to complete **driving the Leadville drainage tunnel** as a step toward unlocking large reserves of war-vital zinc, lead and manganese ores. The tunnel was started in December, 1943, under a previous contract and 6,600 ft. was bored before funds ran out in August, 1945. The first phase of the tunnel cost $1,250,000. A total of $500,000 is available for the tunnel, which must be driven another 3,500 ft.

★William Arnett of Golden, and Arthur Hampshire of Denver, prospectors, report **discovery of 56.42% copper ore** that carries $2.10 in gold, .70 oz. silver in Jefferson County, above Golden near forks of north and south Clear Creek. The two partners sent some of the ore from the large blow-out to the Nevada Mines Division of Kennecott Copper Corp., at McGill, Nev., and received an assay certificate showing valuation of approximately $212.16 per ton.

★**Construction of a 22-ton dry bank dredge has been completed** by the Universal Dredge Manufacturing Co. of Denver and the machine is now at Alma, Colo., where it will be used in gold placer mining. Albert Hack, general manager of the company, said it is capable of processing 200 yd. of earth daily to recover placer gold. A dragline and scoop shovel are used in connection with the machine. The dredge will be used by Platte River Placer, Inc., a firm near Alma. Henry Nelson of Fairplay is manager of the company.

★**Consolidated Caribou Silver Mines, Inc.,** plans to move its mill to its mining property so that the company can treat its pitchblende dump ore at a profit. In the meantime, the dump ore is being screened and stockpiled. The company is working two shifts with about 30 men employed.

IDAHO

★**Coeur d'Alene Mines Corp.** is drifting on the silver-copper vein recently discovered south of the Polaris fault on the 2,800-ft. level. The development ore is being stockpiled, but a trial run of 300 tons was put through the company's milling plant this month.

★An exploratory raise in the **Orofino mine** near Murray, Idaho, owned by the Dan Murphy Leasing Co., has encountered a 16-in. width of high-grade galena ore. The mine has shipped ore from lower tunnel workings, but was closed down two years ago following a fire which destroyed the compressor plant.

★Six months current year production from the **Silver Syndicate mine,** operated through Sunshine, produced 28,615 tons of ore which yielded 576,795 oz. silver and 3,180,344 lb. lead, according to Norman Smith, mining engineer in charge of the operation.

★According to a report filed by the SEC, the **Silver Summit Mining Co.,** controlled by the Polaris Mining Co., has increased its gross earnings in the second quarter of the current year 78%. According to the report the mine's earnings for the second quarter this year totaled $372,009, as compared with $208,467 for the first quarter. Ore concentrate shipments are averaging around $40,000 per carload, carrying from 700 to 1,000 oz. silver

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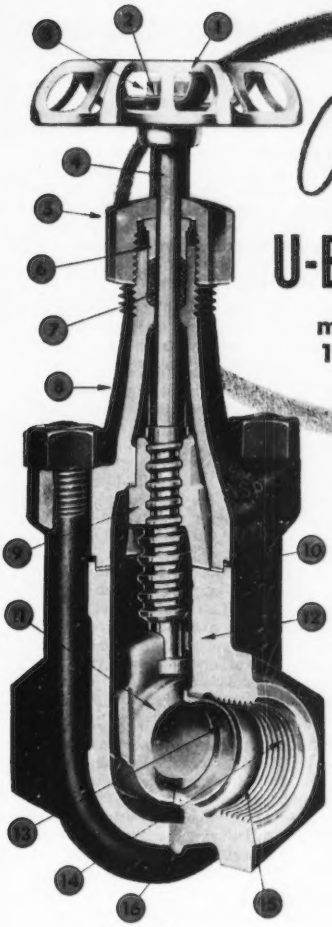

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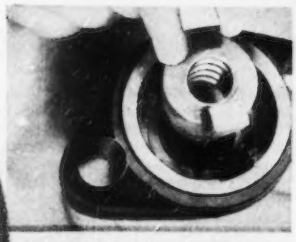

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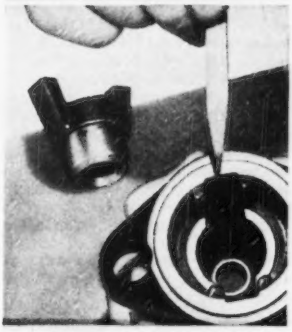

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Idaho *(Continued)*

and 17% copper per ton. The orebody has been developed on the 3,000-ft. level for a length of more than 800 ft. and has recently been opened on the 3,200 and 3,400-ft. levels where it shows equally as good values. The mine is indebted to Polaris for approximately $1,000,000.

★**Federal Mining & Smelting Co.** will sink its Morning mine shaft at Mullan from the 4,850 to the 5,050-ft. level, giving the mine a depth of 940 ft. below sea level. In its annual report for 1949 the company estimated the cost of this development at $150,000 and a period of 18 months to two years to complete the work. The company's 1948 report stated that "the Morning mine is believed to be the deepest lead mine in the world. The remaining possible ore is probably of a wedge shape about 1,300 ft. or six levels deep. If we suppose the entire wedge to be of the width and metal content of the lowest level so far mined, it contains, at a rough estimate, 32,500 tons of lead, 39,200 tons of zinc and 942,000 oz. of silver. It would take four or five years to extract it all if prices and other conditions were favorable."

★**Nabob Mining Co.** is now paying new development expenses from funds received on royalties on ore from the upper workings and from milling the leaser's ore, together with development ore from the lower tunnel, according to H. J. Hull, president. The company is developing two vein systems, the Crystolite and Denver.

★**The C & L Construction Co.**, of Pocatello, Idaho, is operating a gold dredge on 17,000 acres of dredging ground near the old rich placer camp of Gibbonsville, Idaho.

★**Sidney Mining Co. is now sinking a shaft** from its lower tunnel level to the surface. For the first half of 1950 production totaled 8,247 lb. of zinc, 4,417,710 lb. of lead and 103,049 oz. of silver.

★**Hypotheek Mining Co. has unwatered the mine** and retimbered and equipped the shaft to the lowest level. The company has also constructed surface bins for both ore and waste preparatory to prospecting for a continuation of the vein system which terminated on a fault. The mine has been a shipper of high-grade lead ore.

★**Rare Earths, Inc.**, mineral company of McCall, Idaho, is preparing to start dredging operations for gold and monazite sand on Warren Creek about Sept. 31, according to Walter Hovey Hill, who is consulting engineer for the company. The company started moving its "Mickey Mouse" Yuba dredge from McCall to the Warren site. The dredging ground to be worked is said to average about 60c. per cu. yd. in monazite, zircon, garnets and gold.

★**Coeur d'Alene Silver Giant Mining Co.**, after driving a crosscut tunnel to prospect ground in a mineral belt on Big Creek, one mile south of the Sunshine mine, has started diamond drilling the ground from the face of the crosscut.

GEORGIA

★C. B. Arrington, operating the **Arrington Mining Co.**, has sold the 1,120-acre property at Oremont in Polk County to Albea York, who is continuing operations. The mine is producing five cars of iron ore per day. The deposit averages about 45% ore.

Arrington Mining Co. is concentrating its activities at Sidhart, Ala., about 12 miles west of Cedartown, Ga., where a new jaw crusher and diesel power unit have been installed. The iron mine is now producing about five cars per day.

★**Thompson-Weinman Co.**, Cartersville, Ga., has sold its heavy-media plant for separation of barytes to Sam Woodward, Cedartown, who is installing the equipment in a new iron ore plant. Thompson-Weinman is employing a flotation system to treat impounded mud pond tailings from jigging operations in past years. The company is recovering a finer grade product by this method. $BaSO_4$ runs 98% plus with iron content about ½%.

★**The U.S. Government is conducting exploratory drilling** in the Cartersville area to determine the extent of the manganese deposits. Capt. Garland Peyton, state geologist, made a survey of the region with J. R. Thoenen, chief technologist for the U.S. Bureau of Mines, Region VII, and V. J. Lynch, Government mining director for the region.

IRON COUNTRY

★The CIO United Steelworkers union has petitioned the National Labor Relations Board for union shop elections among employees of Lake Superior area iron ore mining companies, under the provisions of the Taft-Hartley law.

★**Miller-Mohawk mine at Aurora**, operated by Pickands, Mather & Co., is now producing iron ore, mostly from railroad track benches left when the mine was last operated. Last shipments were made in 1927 when 368,040 tons were loaded. Remaining tonnage is estimated at nearly 1¼ million tons.

★The **"Sentinels of Safety"** trophy, presented by the Hercules Powder Co. to the mining company achieving the best record of safety in the year, went to the management and employees of the Lake mine of the Embarrass Mining Co. on Aug. 15. The award was received by T. C. Thielman, general superintendent of this Pickands, Mather & Co. operation. The mine had the best record of all open-pit mines with 596,780 man-working hours and no lost-time accidents.

★**Republic Steel Corp.** and **Armco Steel Corp.** have jointly acquired in equal shares 100% ownership of the stock of Reserve Mining Co. which controls a vast deposit of magnetic taconite iron ore located at the eastern end of the Mesabi Range in Saint Louis County, Minnesota.

★**The Virginia open-pit mine**, north of Ironton on the Cuyuna range and operated by Zontelli Brothers, is again producing and shipping ore.

★The 1150-B dragline, and portable screening plant, stacker and conveyor equipment are being installed at the **M. A. Hanna Co.'s Morton mine** after having completed their work at the South Agnew. The initial dirt conveyor system to the dump will be somewhat shorter than the 1½ miles at the South Agnew; but as the dump extends with removal of the heavy overburden (160 ft.) the distance will be gradually increased to about two miles. More than 2 million cu. yd. of stripping has now been moved from the Morton, and a large pit is taking shape in that area. New shop buildings are being erected and pumping is being carried on from the old Morton concrete mine shaft.

★The M. A. Hanna Co.'s **Mississippi group of mines** near Keewatin, which includes the Mesabi Chief, Bray, Stein and Mississippi No. 3, is in the active shipping list. The Mississippi group of mines has shipped more than 17 million tons of ore since 1929 and has been the leading producer for the Hanna company on the Mesabi range.

★Work has been begun on a new steel washing and screening plant for **M. A. Hanna's Douglas group of mines** near Fraser. The old plant, mostly of wood, is being dismantled and some of the equipment will be used in the new plant. A screening and crushing plant will be constructed in the Duncan pit from which a 30-in. conveyor belt will bring the ore to the surface.

★The **Mary Ellen mine** of the Stanley Mining Co. near Gilbert is using a horizontal coal auger machine to replace churn drill holes. H. F. Manseau, superintendent at the mine, reports that drilling costs less per foot and the horizontal holes require less powder. Drilling and blasting costs are less than 5c. per ton of ore.

★The **W. S. Moore Co.** is preparing the Knox mine, near Aurora, to reenter the active list after having been idle since 1918, when the last shipment was made from an old stockpile. The Knox was listed as exhausted. Two other old mines in this area have been reopened during the past year—the Miller-Mohawk and the St. James.

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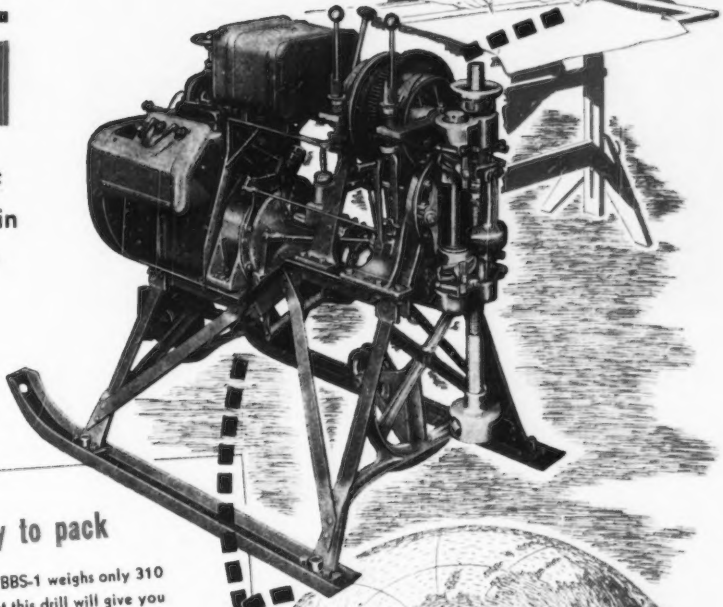

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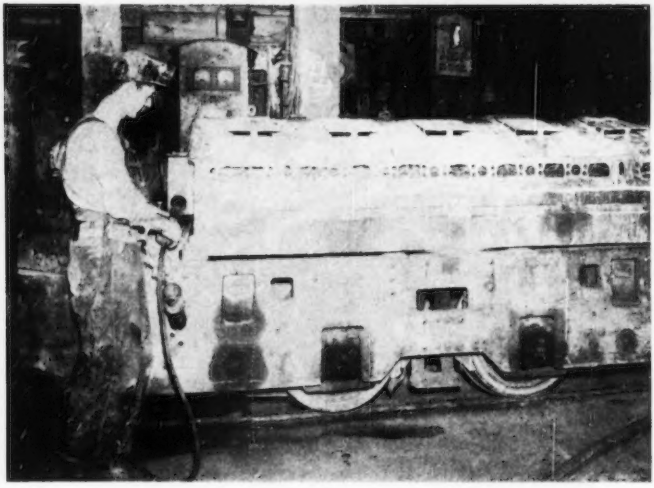

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STORAGE BATTERIES

Iron Country *(Continued)*

weeks because of a fire on June 14, which destroyed the combination enginehouse and dry, 100 men have returned to work at **North Range Mining Co.'s** Book mine at Alpha. The mine will operate on a five-day-per-week schedule.

★M. A. Hanna Co.'s **Wauseca mine** at Iron River is operating a new crushing and screening plant installed in the headframe.

★**Average cost of mining underground ore** in Michigan mines for 1949 was $3.1188, almost 9c. per ton higher than in 1948. With taxes, overhead, transportation and marketing added, the cost at lower lake ports was $5.8723 per ton. The total average cost for siliceous open-pit mines in 1949 was $3.3305 per ton at lower lake ports.

★Cleveland-Cliffs Iron Co.'s **Mather "B" mine has begun to produce** and the tonnage hoisted is gradually increasing. High-grade ore is being taken from a cross-cut on the 6th level which connects with "A" shaft, at a depth of about 2,200 ft. Three crosscuts are being developed on the 6th level.

★The Vicar mine of the Jones & Laughlin Ore Co. has made its **first shipment of ore from the property.** By next season production will have reached a substantial tonnage.

★Because of the demand for iron ore, the **Cleveland-Cliffs Iron Co. has increased its working schedule** at all its Michigan mines from five to six days per week. The M. A. Hanna Co. mines in the Iron River district have been on a six-day week basis.

★**The shaft at the M. A. Hanna Co.'s Wauseca mine is being sunk** an additional 306 ft. to open up the 9th level and to provide room for a pocket and crusher space below the new level. Broken rock from the shaft sinking operation is loaded into the hoisting bucket by a hydraulic clam.

★Employees of Pickands, Mather & Co.'s Buck group, Davidson, James and Sunday Lake mines in Michigan, have **voted by a large majority in favor of the union shop.** This gives the union the authority to enter into negotiations with the company on the question of the union shop. Floyd J. Hill, CIO representative, has announced that the union will petition the National Labor Relations Board for elections at the mines of M. A. Hanna Co., Cleveland-Cliffs Iron Co., Inland Steel Co., Republic Steel Corp., North Range Mining Co. and other mining companies of the area.

MICHIGAN

★**Settlement of the wage dispute** between Calumet & Hecla Consolidated Copper Co. and Local 4312, United

Steelworkers of America, CIO, represented the second wage increase negotiated during this year. The first agreement reached between the company and the union provided for 11c. per hr. increase; three weeks' vacation with pay for employees with 20 years of service, and other concessions. The recent settlement provided extra benefits amounting to 7½c. per hr.—5c. per hr. increase in wages, 2c. per hr. to cover time-and-one-half payments for all work performed on Sunday, and ½c. per hr. to increase sick benefits.

Quincy Local 4311, United Steelworkers of America, voted to accept a 12c. per hr. increase in wages negotiated by the union bargaining committee and the Quincy Mining Co. The increase will be retroactive to July 1. Agreement was reached in the presence of John Luecke of the United States Conciliation Service. The terms of the previous agreement will continue in effect until June 30, 1951, with one wage reopener during this period.

MONTANA

★**Superior Fluorspar Co.**, a Montana corporation headed by Frank Clark of Billings, has extended its negotiations with the Coeur d'Alene Extension Mines, Inc., of Superior, by purchasing the entire property of the latter company, subject to a vote of stockholders of the vendor company.

★**H and H Co.**, of Lewistown, expects to prospect for and extract gold from placer deposits in Yogo Canyon, Judith Basin County, about 50 mi. west of Lewistown, according to Jack Hughes, president of the company.

★U. S. Bureau of Mines and U. S. Geological Survey are supervising diamond drilling operations on the properties of the **Trout Mining Division** of the American Machine & Metals, Inc., Philipsburg, Granite County, with the object of finding extensions of the manganese orebodies in that vicinity.

★According to advices received from Senator James E. Murray and Representative Mike Mansfield, the Harvey Machine Co., Torrance, Calif., has decided to **build an aluminum plant** at the foot of Teakettle Mountain in the Hungry Horse Dam area, to reduce partly refined bauxite ore to pure aluminum ingots. It is planned to ship the ingots to the company's California plant for further manufacturing.

NEVADA

★Following announcement of a rich strike at the **Mill Creek Copper Co.** property at Mountain City, plans are going forward for a $50,000 development program on the property. It will

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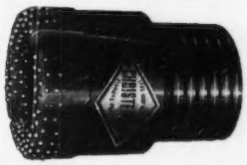

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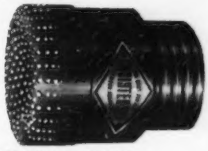

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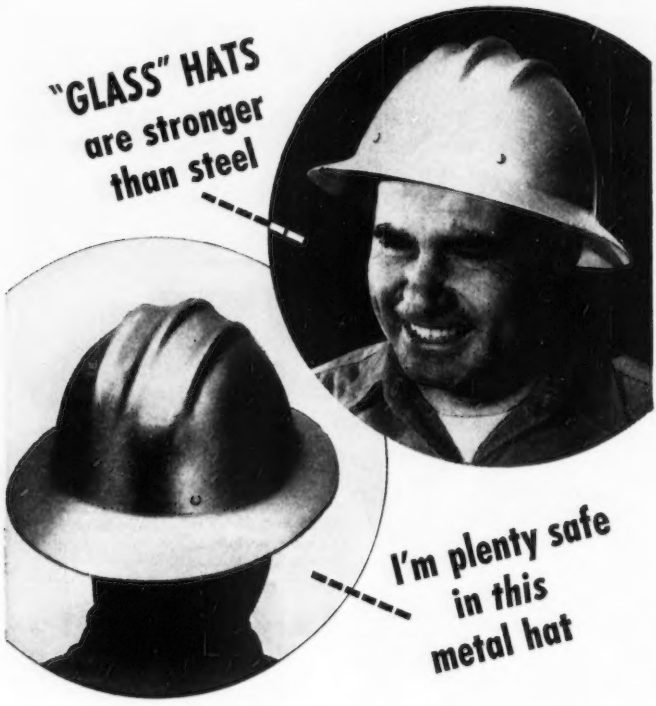

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Nevada *(Continued)*

include pumping out the 565-ft. level. The newest ore discovery was made about 80 ft. above that level in the upper winze. Eleven ft. of water covered the vein.

★**Round Mountain Gold Dredging Corp.** operations in Nye County are in full production this summer, and the output is reported at more than $3,000 daily. The firm's big electric shovel is working into the base of a mountain from which more than $5,000,000 was taken during the early years of the development of the Round Mountain region. The plant includes a large ball mill, washing plant and gold recovery units, and is designed to handle a minimum of 17,000 tons of alluvial ore or gravel daily.

★Repair work has been started at the **Ruby Hill mine** in Eureka County, which was closed down nearly two years ago as the result of an excessive flow of water. Vern Manz, of the Eureka Mining Co., Ltd., says a crew of 30 men will be employed, and the first work will consist of repairing the Fad shaft's upper sections.

★**Getchell Mine in Humboldt County is new producing oxide ore** at the pre-war rate of 1,000 tons per day, and the oxide mill heads assay about 0.1568 oz. of gold per ton. Average recovery is running about 85%. Plant reconstruction and expansion have progressed to a point where 1,500 tons of sulphide ore could be treated on short notice. That will take place when the supply of oxide ore is exhausted, which is expected to happen sometime in September.

★Active operations at the **Grey Eagle mine** near **Beowawe** in northern Lander County got under way during August. The property, an early day producer of lead-silver and zinc, was acquired some time ago by Tonopah mining men and California interests. A large tonnage of dump material mined by former operators is being trucked to the Tenabo mill, 12 mi. distant. It is estimated there are 10,000 tons of this ore which can be handled profitably. It is further proposed to start underground mining operations immediately. This will consist of tunnel development exposed and mined by early operators in upper levels. A new mucking machine has been acquired to speed the work.

★**Anaconda Copper Co.** is putting the Victoria Copper Mine in White Pine County back into operation after a four-year shutdown. The property is being modernized and developed, and the shaft will be enlarged to the 150-ft. level.

★Sixteen tons of silver-lead ore from the **Klondike mining property** near Tonopah was shipped recently to the Selby smelter in San Francisco and the return value was better than $94 per ton. David F. Harris and his son Allen are operating the mine, and report that the orebody is increasing in size and values.

★An underground mining project has been launched at the **Gabbs Exploration Co.** property in the Illinois mining district 12 mi. north of Gabbs. The operation is the result of successful diamond drilling on the tungsten property. Drilling operations were conducted by a Utah firm and are said to have indicated the existence of a large deposit of good grade tungsten ore.

★Having completed the initial 500 ft. of exploration crosscut tunnel at **Candelaria**, in Mineral County, the Newmont Mining Co. is now preparing to continue the work for another 500 ft. Due to adverse conditions, about 75 days were required to drive the first 500 ft.

NEW MEXICO

★**Ira Wright**, geologist and mine operator of Silver City, has taken leases and option on the Merrimac mine in the Organ district (east of Las Cruces) and is producing 25 to 30 tons of ore, mostly zinc, daily and shipping to AS&R mill at Deming.

★International Mine, Mill & Smelter Workers Union, ousted by CIO after last winter's long strike at three potash mines in the Carlsbad district, has been replaced as a bargaining unit at **International Minerals & Chemical Corp.**, where 113 workers who switched from IMMSW to International Association of Machinists signed an agreement carrying wage increases of 11 to 13c. per hr. At Potash Company of America, the powerhouse, mine mechanics, pipefitters, painters, carpenters, steam firemen and water plant operators and hoistmen are now represented by International Association of Machinists. Production units, mine, refinery, chemical plant, mill, loading dock, labor crew and laboratory clean-up and sampling was won by Local 415 of the International Union of Mine, Mill and Smelter Workers.

★In a spurt of activity the copper and zinc mines of the Central district in Grant County have about **absorbed all the idle labor** in the area but are not expecting a labor pinch on account of military demands on manpower.

★Hearing of **lively demand for scrap mica** a group of Albuquerque investors are interested in building a mill to work large deposits of mica in northern New Mexico.

★**Average weekly wages in the mining industry** in New Mexico for July was $70.96 for a work week of 41.4 hr., highest wage rate in the state. Between 7,000 and 8,000 are employed in mining in the state.

★**A voluntary reduction of freight rates** by railroads has cut the cost of shipping potash from Carlsbad and Loving in southeastern New Mexico to Albuquerque from $10.37 per ton to

(*Continued on page* 128)

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PERSONAL NEWS

Ralph A. Watson, formerly field geologist for the Anaconda Copper Mining Co. at Butte, has been appointed assistant geologist for the Great Northern Railway with headquarters in Spokane. He graduated from the University of Wisconsin in 1946 with a degree in mining engineering. Mr. Watson replaces **A. L. Greenlee**, who has resigned.

Howard Cameron has been appointed assistant secretary-treasurer of Northwest Mining Association at Spokane, Wash. **Roger O. Oscarson** will continue to supervise the office. Mr. Cameron, son of a gold dredge operator of Condon, Ore., attended Washington State College, and was graduated from Walla Walla College.

Arthur S. Cherouny has been appointed assistant to the president of Kennecott Copper Corp., in charge of industrial and public relations. He joined the company in 1937 and has been secretary since 1941. **Robert C. Sullivan** has been named secretary to succeed Mr. Cherouny.

J. C. Carlile, formerly mill designer with **O. W. Walvoord & Co.**, is now field engineer with Colorado Iron Works Co., with headquarters in Denver, Colo.

Roy E. O'Brien has been appointed western secretary for the mining branch, American Institute of Mining & Metallurgical Engineers. The secretary's position, newly created to serve western members, will serve Montana, Colorado, Wyoming, New Mexico and all states west. Mr. O'Brien, a native of Colorado, worked for Anaconda Copper Mining Co. in Mexico as engineer and assistant foreman from 1927 to 1935. He served as mine foreman, mines superintendent and plant superintendent for Mountain City Copper Co., in Nevada, until 1947 when he came to the Salt Lake City office of International Smelting & Refining Co. His headquarters for AIME will be in the Newhouse Bldg., Salt Lake City.

Lucien Eaton, consulting engineer of Milton, Mass., was in Matheson, Ontario, in June for the Canadian Johns-Manville Co., and in July and August examined iron ore concessions in northern New Quebec and on the east coast of Labrador. He is now en route to Australia for H. A. Brassert & Co. of New York.

Karl A. E. Berg is now manager of iron ore properties of the Northern Pacific Railway and its subsidiaries in Minnesota. He joined the Northern Pacific in the geological department at Billings, Mont., in 1920. In 1949 he was appointed assistant chief geologist, which position he held until his present appointment. Mr. Berg succeeds the late **Carl Zapffe**, who retired May 1, and whose death occurred Aug. 28.

R. C. Bacon has resigned his position as assistant manager of Cia. Administradora de Minas, Lima, Peru, and has joined W. R. Grace & Co. as assistant to **William Flatow**, vice president.

DR. LESLIE G. JENNESS has been appointed assistant to the president of Kennecott Copper Corp., in charge of research. For the past three years he has been director of research for the Hum Ko Co. in Memphis, Tenn., and prior to that he was division head of Linde Air Products Co. in charge of inorganic research and development.

E. G. Plowman, vice president of United States Steel Corporation of Delaware, has been appointed as director of military traffic service, by the Secretary of Defense. **Benjamin F. Fairless**, president of United States Steel, has announced that Mr. Plowman has accepted the position on a temporary basis.

Robert D. Bradford, general manager of American Smelting & Refining Co. properties in Utah, has been appointed general manager of the company's western department. The territory covers all AS&R plants west of Omaha, with headquarters in Salt Lake City. Announcement of the promotion was made by **J. D. MacKenzie** of New York, vice president in charge of operations. Mr. Bradford will continue as president of the Garfield Chemical & Manufacturing Co., which is jointly owned by AS&R and Kennecott Copper Corp. **W. G. Rouillard** has been named manager of the AS&R Garfield plant where he had formerly served as operating plant manager.

D. W. Robinson, civil engineer, **L. W. Johnson**, mining engineer, and **J. A. Paulford**, mechanical engineer, have joined the engineering staff of Oliver Iron Mining Co. at Hibbing, Minn., as trainees.

Herbert C. Enos, mining engineer of Chatsworth, Calif., has returned to his home after completing examination of mines of the Mother Lode.

William W. Lynch, who has been in charge of metal sales for Calumet & Hecla Consolidated Copper Co. since Jan. 1, 1944, has been named vice president. His headquarters are in New York.

Dr. A. F. Banfield, associate geologist of Behre Dolbear & Co., has returned after spending the season directing exploration and mapping in the Yellowknife area.

Frank M. Estes, mining engineer, left New York recently for Indonesia to investigate mineral resources and study economic conditions.

T. L. Joseph, assistant dean of Minnesota School of Mines & Metallurgy, spent three weeks in Sweden during the early fall as guest of the Swedish Iron and Steel Institute. While there, he observed iron ore mines and a number of iron and steel plants. On Sept. 8 he delivered two lectures before the Institute in Stockholm.

Roland Trevor Trenaman and David Alan Guthrie, of Trail, B. C., sons of two employees of The Consolidated Mining & Smelting Company of Canada, Ltd., tied for first place and will each receive a Cominco Undergraduate Scholarship for 1950. Dr. C. H. Wright, chairman of the Scholarship Committee, made the announcement Aug. 25. Mr. Trenaman intends to major in geology at the University of British Columbia. Mr. Guthrie will also attend the University of B. C., where he plans to study chemical or metallurgical engineering.

William Huff Wagner, consulting mining engineer, is now located at 3601 Connecticut Ave., N. W., in Washington, D. C.

OBITUARIES

Leo Ranney, mining engineer, died Sept. 15 at his home in Morro Bay, Calif. He was 66. A native of Iowa, he received a B.S. degree in geology from Northwestern University. He devised horizontal techniques for obtaining water, oil and coal gases from the ground.

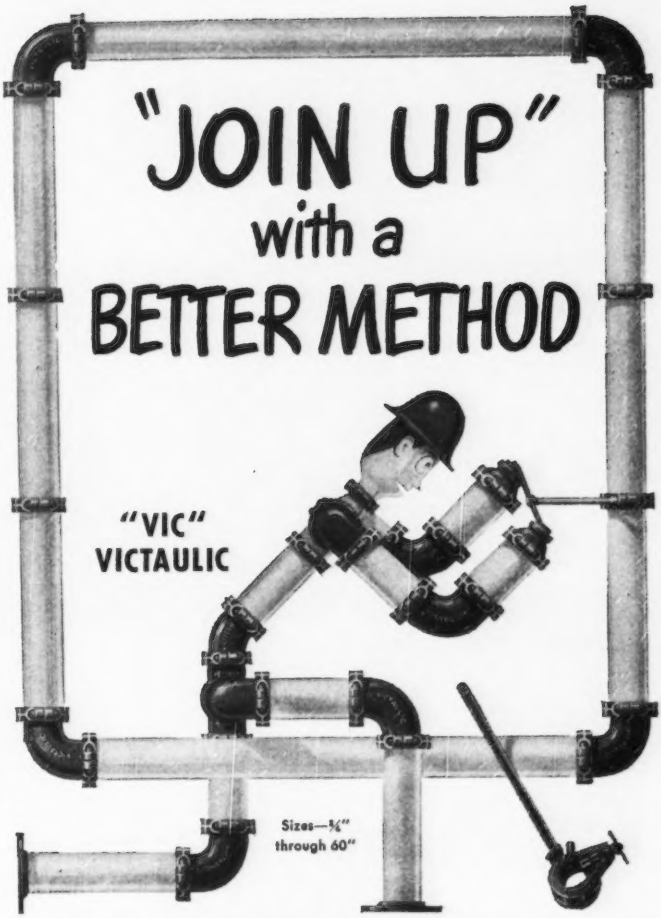
Charles L. Baer, 75, general manager of the Connellsville Manufacturing & Mine Supply Co., Connellsville, Pa., died suddenly on Aug. 23. He joined the company in 1902 and was made general manager in 1926.

George Dawes Van Arsdale, chemical and metallurgical engineer of The Dorr Company, died Aug. 24. He was generally recognized as one of the pioneers in the development of metallurgical processes for the treatment of low-grade copper deposits of the southwestern United States. Just prior to his death he had completed the manuscript for a book on this subject, which will be published posthumously. Mr. Van Arsdale was associated with Phelps-Dodge Copper Corp., and had acted as consultant to that company, Inspiration Consolidated Copper Co. and various other mining and engineering companies in the West, before joining the Dorr Co. in 1941.

A. J. Meyers, formerly chief engineer at the Inter-State Iron Co.'s Hill-Annex mine, Calumet, Minn., died July 20 at Green Bay, Wis. He retired in 1946.

CARL ZAPFFE, former manager of iron ore properties of the Northern Pacific Railway Co., died in Brainerd, Minn., Aug. 28, following a brief illness. Prior to his retirement May 1, he had served the railway company since 1908. A graduate of the University of Wisconsin, he served on the Cuyuna iron range from 1905 until 1908, when he was appointed geologist for Northern Pacific. He was made manager of the iron ore properties in 1925, and remained on the Cuyuna range during his entire career. He continued to remain a consultant with the Cuyuna iron ore district after his retirement. Mr. Zapffe was the author of many technical articles and several historical treatises.

Charles Volney Averill, former mining engineer with the California State Division of Mines, Department of Natural Resources, died Aug. 28. He graduated from the University of California College of Mining with honors in 1914 and began his career as a surveyor and geologist with various Nevada mining companies. From 1918 to 1926 he was with the Tonopah Extension Mining Co., Mr. Averill joined the California State Division of Mines as a junior mining engineer in 1928, and later served as district mining engineer and supervising mining engineer.



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26TH VICTAULIC YEAR

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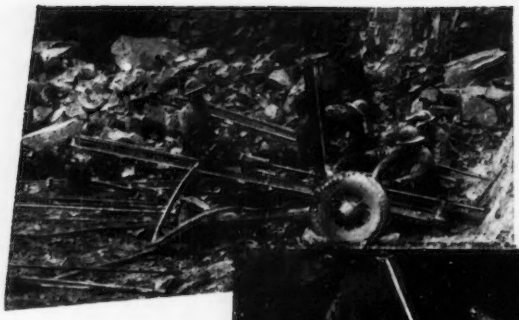

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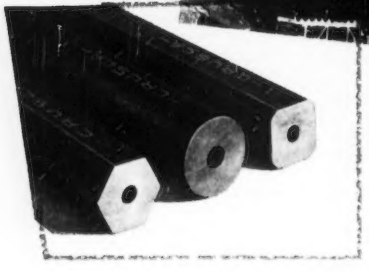
CRUCIBLE HOLLOW DRILL STEEL
for LONG LIFE!



The *long life* of Crucible Hollow Drill Steel . . . even under the severest drilling conditions, is the reason why you get *lower cost per foot drilled* when you use this high quality drill steel. This is no idle claim! Controlled hardenability, perfection of stress-bearing surfaces and uniform processing all contribute to your assurance of maximum performance.

But even more! *Every lot* of Crucible Hollow Drill Steel is *pre-tested* for the harder, faster blows of modern drills. Cut down on costly job delay, and get the most out of your drilling equipment...specify Crucible Hollow Drill Steel.

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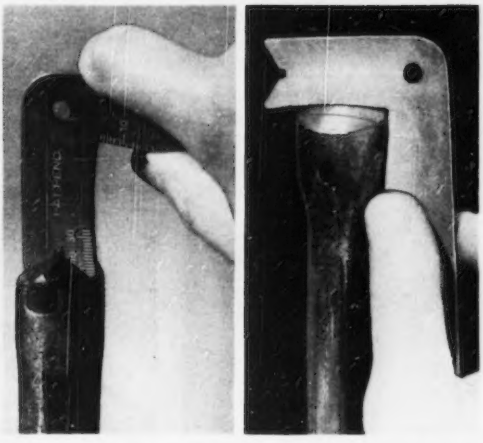
NEW PRODUCTS DIGEST

For further information on these products, circle item numbers on card—insert and mail.

LIGHTWEIGHT DRILL (42 lb.) has won friends and influenced mining men by its ease of handling, versatility and low drilling costs. It's well adapted for slashing jobs.



COROMANT STEEL is guaranteed by manufacturer. Special templet, serving as guide for regrinding, measures depth of tungsten carbide insert and angle of cutting edge.

FIELD CHECK

Lightweight Drill, Swedish Steel Win Popularity

TABLE I
COROMANT STEEL GUARANTEE

Type of Failure	Guarantee	Conditions
Insert failure	Credit for full value of steel	Insert height must be 12.5 mm. or more. Corners not worn beyond 8 mm. from top. Cutting edge width not worn beyond 3 mm.
Collar failure	Recollar steel free of charge	At least 10.5 mm. insert height must remain.
Rod failure	Credit for full value of steel	At least 10.5 mm. insert height must remain.

Guarantees apply if there is no evidence of abuse and if grinding instructions have been followed.

LOWER COST per foot, more feet drilled per shift, decreased air consumption, ease of handling and lower initial cost all contribute to the successful invasion of Quebec and Ontario mining camps by the Atlas diesel lightweight rock drill using Sandvik "Coromant" steel with a tungsten carbide chisel bit. This combination working on an air-operated jackleg has been widely accepted in eastern Canada.

Lower drilling costs and increased footage, as compared with conventional machines, results from several factors. First, only one man is required per machine. Then, set-up time is only a fraction of that required in standard practice and steel changes, too, can be made much faster. All told, actual drilling time per shift, according to operating tests, shows an increase of about 25%.

Air consumption of the "Swede" machine is about half that of larger models. This means more machine operating or less wear and tear on the compressor. There are also savings in accessories such as being able to buy smaller (and cheaper) air hose. Drilling speed, while it varies in different rock, is generally comparable with other machines.

Versatility of the lightweight machine and jackleg cannot be overlooked when it is found competing with drifters, stopers and sinkers. Miners say that handling of the lighter machine, even without a helper, is less tiring, too.

Main disadvantage of the steel lies in sharpening. Coromant steel

is expensive and to get your money's worth from its high quality you must get maximum life from steel and tungsten carbide insert. This means keeping the chisel bit in good condition. While excessive grinding is not necessary, ordinary grinding poses a problem if several machines are used in widely separated working places. Either a portable grinding unit must be taken from place to place or the steel must be carried to a central grinding station. Several mines report that best practice requires a specially trained man is needed for grinding.

Here's what some reports from the mines say.

An underground superintendent on an inclined shaft sinking job stated: "Drilling costs (using the lightweight machine) can be greatly reduced, and using four machines of this type, an estimated 6 hr. per round in time can be saved, or an over-all saving of approximately 20% of shaft sinking time."

A gold mine in Quebec reported: "With the use of two men and two rock drills it would be possible to cut labor costs as high as 50%."

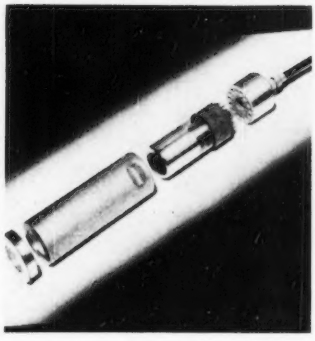
A report from an eastern base metal producer said: ". . . In a unit of time the Swedish machine will drill 1.61 times more footage (than the standard heavy rock drill). Otherwise expressed as an improvement of 61.8% in performance with reference to time."

In British Columbia, a large mine noted: "Twenty-five percent more drilling time (per shift) since there is no time loss due to changing steel or chucking. Also setting up time is a fraction of the time setting up the conventional bar and arm."

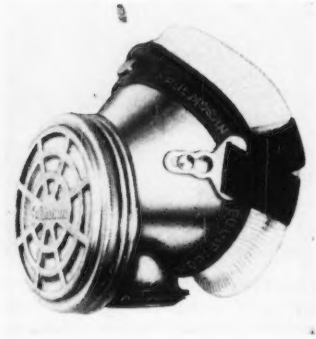
Important to the user is the guarantee (see table) on each piece of Coromant dull steel. In effect the steel is guaranteed against insert failure for one-third steel life and collar or rock failure for two-thirds steel life.

The Atlas diesel lightweight dull and Coromant steel are available from Canadian Copco, Ltd., Montreal. For more information please circle No. 1 on the addressed, postage-free reply card opposite p. 126 and mail as soon as possible.

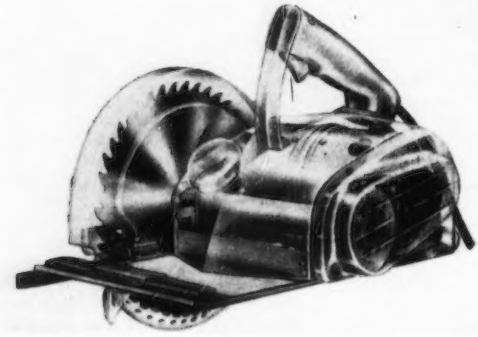
SMOKE INDICATOR continously indicates density of smoke passing through stack. Signals when set value is exceeded. Combustion Control Corp., Cambridge, Mass. (2)



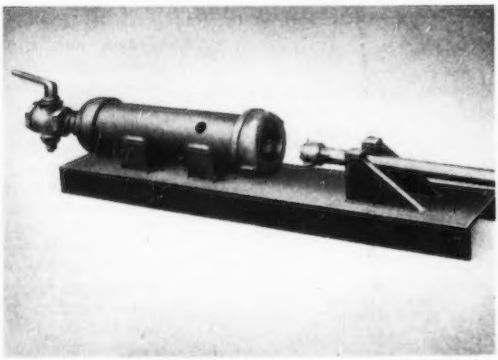
ALPHA SCINTILLATION COUNTER for use with commercial scalers and counters, selectively detects and measures alpha particles. Tracer-lab, Inc., Boston, Mass. (3)



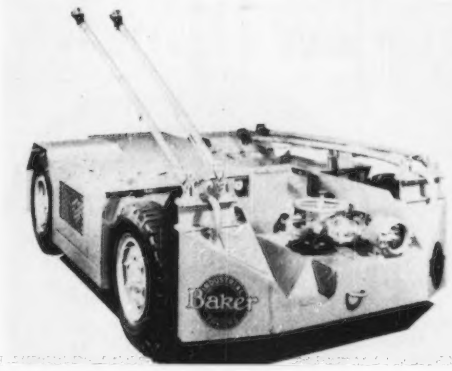
RESPIRATOR designed for lead dusts can be used for any dustless toxic. Light, compact unit uses single chemical filter. Pulmosan Safety Equipment Corp., Brooklyn. (4)



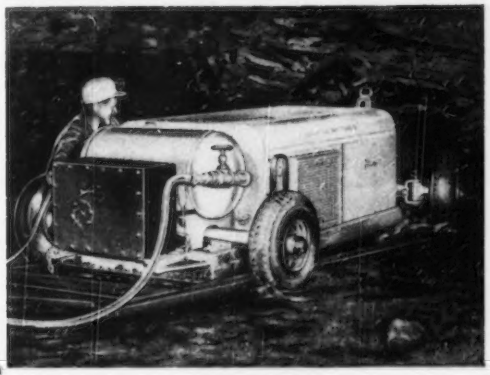
PORTABLE ELECTRIC SAW with 8½-in. blade cuts 2 11/16 in. With 1½-hp. motor, weighs 19 lb. Use of V-belts entirely eliminates gears. Metal parts are stamped, not cast. Syntron Co., Homer City, Pa. (5)



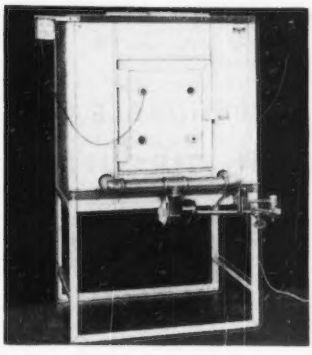
KNOCK-OFF BLOCK removes single-pass bits from steel, quickly and easily. Also available in a Hole-Saver to reclaim loose bits and broken steel from holes. Rock Bit Sales & Service Co., Philadelphia, Pa. (6)



TROLLEY TRACTOR for supplementary transportation or direct haulage to face works on trolley or battery. Automatically recharges on trolley or when idle. Baker-Raulang Co., Cleveland, Ohio. (7)



SELF-PROPELLED COMPRESSOR with pneumatic tires, automotive steering, only 33 in. high, operates right next to the job. Four standard sizes deliver 105 to 315 cfm. at 100 psi. Davey Compressor Co. (8)

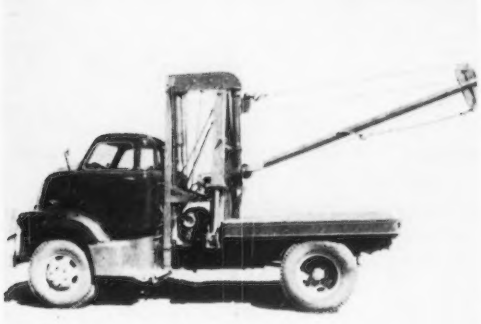


PRECISION FURNACE for heat treating of metals uses natural or bottled gas, has max. temperature of 2,500 deg. F. Sizes: 1.8 to 20 cu. ft. A. D. Alpine, Inc., Calif. (9)

If You Want to Learn More . . .

about any product on these pages, circle the number of the item (in parentheses) on the postage-free reply card opposite p. 126, and mail as soon as possible.

TRANSFER PUMP working on air line pressure is safe, economical, fast way to transfer liquids from bulky containers to point of use. General Scientific Equipment Co. (10)



TRUCK CRANE easily installed, operates hydraulically. Capacity is 3 tons with 11-ft. boom; 1¼ ton with 20-ft. boom. Driver controls 180 deg. swing from cab. Pitman Mfg. Co., Kansas City, Mo. (11)

HOE FRONT for the D6 Hystaway tractor-mounted ½-yd. excavator has fast swing, long reach and lots of power. Both 23 and 33-in. wide dippers are available. Hyster Co., Portland, Ore. (12)

For Surface Mines...

...For Underground Mines

...A SAFE, DEPENDABLE CABLE FOR SIGNAL AND CONTROL CIRCUITS.

In open air or underground, Simplex - ANHYDREX Signal and Control Cables have what it takes to provide safe, trouble-free service under all operating conditions.

Anhydrex SA insulated and neoprene jacketed, they provide:

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- — High dielectric strength
- — Low power factor
- — Low dielectric constant

Protection Against Operating Hazards
- — Water and moisture
- — Grease and oils
- — Heat and sunlight
- — Bad weather
- — Rough handling

Safe Operation
- — Anhydrex SA insulation has stable electrical properties and is physically durable to withstand rigorous service. The neoprene jacket is especially tough and it will not support combustion.

Simplex-ANHYDREX Signal and Control Cables have no metallic coverings to crystallize and corrode; are not harmed by vibration and stray currents. They are flexible, lightweight, and small in diameter; easy to install, splice, and terminate.

SIMPLEX-ANHYDREX

WRITE FOR CATALOG 1013

SIMPLEX WIRE & CABLE CO., 79 SIDNEY ST., CAMBRIDGE 39, MASS.

Equipment Shorts

MATERIALS HANDLING. Here's an easy way to transfer industrial fluids from large drums or barrels. Air-operated "Fast-Flo" pump fits 2-in. opening, delivers up to 18 gpm. at 150 psi. Pump weighs 15 lb. Comes with bung hole adapter, 3-ft. hose, air control valve and air line coupler. Available: Industrial Div., Gray Co., Inc., Minneapolis, Minn. (31)

NYLON BEARING. Designed to take advantage of nylon's excellent bearing characteristics and at the same time overcome its limitations, the "Nylube" bearing essentially consists of an inexpensive metal outer sleeve with a thin internal liner of nylon. An axial slot in the liner takes up changes in the circumference without effect on the diameter. Bearing is said to be tough, resilient, abrasive-resistant, able to stand temperatures in excess of 250 deg. F. and unaffected by most ordinary industrial chemicals. Available: Thomson Industries, Inc., Manhasset, N. Y. (32)

PHASE CONVERTER. With this phase converter you can use generally lower priced 3-phase, 220-v. equipment on single-phase power lines, maintaining high efficiency and increasing the power factor of the 3-phase equipment. Available 3, 5 or 7½-hp. motors, priced at $120, $160 and $180, respectively. Henry Electric Co., Saginaw, Mich. (33)

HYDRAULIC FLUID. A flame-resistant industrial hydraulic fluid, designated as OS-16, has been field-tested in mining equipment. It is non-corrosive, does not conduct electricity and requires no special precautions in handling. Available: Monsanto Chemical Co., St. Louis, Mo. (34)

PUMPS. New line of vertical turbine pumps with capacities from 50 to 15,000 gpm., features extra size bearings, shaft seals where required and enclosed impellers throughout. Oil or water-lubricated, pumps are available with direct motor, right angle gear or belt drive. Worthington Pump & Machinery Corp., Harrison, N. J. (35)

PLASTIC PIPE. Rigid plastic pipe, "Carlon 'L' " has been developed especially for air lines and transmissions of fluids under moderately high pressures. It has a tensile strength of 5,100 psi. and a flexural strength of about 9,600 psi. Burst pressures vary with diameter (a 2½-in. section has a burst pressure of about 900 psi.) Available: Carter Products Corp., Cleveland, Ohio. (36)

ELECTRONIC TIMER. Compact electronic timer provides automatic control of operation, limit and sequence timing for industrial processes. It will handle jobs such as controlling duration of photoprinting, electroplating and heat treating; limit timing to stop conveyor belts if material piles up; sequence timing with two or more timers for starting and stopping bin vibrators, centrifuges or pumps. Available: General Electric Co., Schenectady, N. Y. (37)

DRY LUBRICATION. Processes that produce a solid film or "dry" lubricant impregnated into the surfaces of metals, plastics, rubber and ceramics to reduce friction and wear, are being offered under the name of Electrofilm Graphite Processes. It is claimed that the desirable characteristics of graphite are retained throughout wide ranges in temperature in a permanent film that is unaffected by exposure to solvents or weather. Some industries are employing the process to reduce erosion and inhibit corrosion. Available: Pyrene Mfg. Co., Newark, N. J. (38)

DRAGLINE SOCKETS. Wire-rope sockets that reduce dragline rope breakage employ socket and wedge that grip rope in true-circle seats. Wide shoulders limit pinching, prevent rope distortion and cutting, and prevent seats from wearing round. Rope cannot flatten or crush; rarely breaks at socket. Available: Baer Steel Products, Inc., Auburn, Wash. (39)

INTERCOM. Unit construction makes it possible to disassemble new intercom master station, replace the amplifier or selector switches and then reassemble the entire unit in only 6 minutes. This and the fact that no soldering of connections is necessary, saves user time and money when he wants to expand or service his system. Two station system can be easily expanded to seven or 11 stations. Available: Executone, Inc., New York, N. Y. (40)

LATCH. Unique cupboard latch employs strong permanent magnet fixed on frame, and plate screwed to cupboard door. It is easily installed, works even when doors sag or warp, holds doors firmly in place but permits easy opening. Trade-named "Leco-Latch," it retails for 80c. Available: Laboratory Equip. Co. (41)

WORK GLOVES. Heat resistant work gloves are washable, offer bare-fingered flexibility and positive grip when handling greasy or oily material. Jomac industrial work gloves come in several sizes and three different materials. Available: C. Walker Jones Co., Philadelphia, Pa. (42)

DIESEL LOCOMOTIVES. A series of industrial diesel locomotives, featuring hydraulic drive, are available in sizes up to 25 tons. Design aims at smooth, uniform power and low maintenance costs. Whitcomb Locomotive Co., Rochelle, Ill. (43)

PUMPS. Are you looking for ideas to solve a pumping problem? See the 16-page bulletin issued by Layne & Bowler, Inc., Memphis, Tenn., entitled "Layne Short Coupled Service Pumps." It contains cut-away drawings of pump bowls and discharge column, and 16 sketches show how vertical turbine pumps can be applied to drainage, re-lift service, cooling towers, recirculation. (44)

USE THIS CONVENIENT CARD

to obtain further information on products and bulletins mentioned in the New Products Digest. Circle item numbers, tear out and mail.
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5	12	19	35	42	49	75	82	89
6	13	20	36	43	50	76	83	90
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My Name ..... Position .....

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For Your Files

This informative manufacturers' literature is free unless otherwise specified. To obtain bulletins circle their numbers on card below and mail.

DRAINAGE PIPE — "Here's the Drainage Structure with a 'One-Two' Punch" describes the structural strength and material durability of asbestos-bonded pipe made by Armco Drainage & Metal Products, Inc. Shows how the pipe is made. Photographs illustrate installations. 6 pp. (71)

GAS MASK. Four-page folder describes advantages of full-vision face piece that provides a way to use the same gas mask for three different services. Acme Protection Equipment Co., Chicago, Ill. (72)

WIRE ROPE. Folder condenses and combines all information on Monarch Whyte Strand wire rope, made by MacWhyte Co., Kenosha, Wis. Includes information on how to order wire rope. (73)

CONCRETE PATCHING. An iron asphalt patching material which makes patching or resurfacing of worn concrete floors fast and easy, is discussed in an 8-page bulletin, "The Masterquick Method," issued by Master Builders Co., Cleveland, O. (74)

AIR CYLINDERS. Complete line of air cylinders made by Lindberg Engineerings Co., Chicago, Ill., is described and illustrated in the 16-page bulletin No. 731. Included are discussion of special features and engineering data. (75)

HARD-FACING. How to select the right alloy, which welding process to use, step-by-step instructions, and information on properties and sizes of 12 Haynes hard-facing materials, are covered in a 40-page manual on hard-facing just published by Haynes Stellite Div., Union Carbide & Carbon Corp., Kokomo, Ind. (76)

PLACER JIG—Complete description of the Dorrco Pan-American Placer Jig, including photographs, drawings, tables of dimension, and operating data can be found in this 16-page bulletin put out by Dorr Co., Westport, Conn. (77)

PNEUMATIC CONVEYING. Transfer of lumpy, granular or powdered materials in a flow of gas or inert gas, without segregation, contamination or excessive abrasion within the system is simple, safe and efficient with pneumatic conveying systems laid out by Convair Corp., Pittsburgh, Pa., in this well illustrated, 12-page booklet. (78)

HYDRAULIC COUPLINGS. The hydraulic coupling issue of *Production Road*, external organ published by Twin Disc Clutch Co., Racine, Wis., contains a lot of valuable information on hydraulic couplings, well illustrated with sectional drawings and photographs. (79)

REBUILDING TRACTOR PARTS. Pocketsize folder tells you what you have to know to go about rebuilding worn tractor parts with "Manganal," (an 11 to 13½% manganese-nickel steel) applicator bars and electrodes. This economic process gives you more wear out of drive sprockets, idler wheels, track rollers, bulldozer blades and tractor grousers. Stulz-Sickles Co., Newark, N. J. (80)

OFFICE RECORDS. Perhaps you can find a way to cut costs in the mine office from among the plentiful suggestions in the 80-page catalog, "Kardex Visible Record Control," published by Remington Rand, Inc., New York, N. Y. Economies in record keeping are pointed out and efficient ways to make calculations from well kept records are indicated. (81)

HANDLING CAUSTIC SODA. "Economic Handling of Caustic Soda with Variable Area Meters" is a booklet offered by Fischer & Porter Co., Hatboro, Pa., dealing with the advantages of purchasing high-concentration caustic soda and diluting immediately during unloading, thus saving freight costs by shipment of less water. Special meter design, piping arrangements, dilution calculations and pump layouts are discussed in detail. (82)

AIR PUMPS. How air pumps operate and where they are used effectively are fully described and illustrated in catalog 450 just issued by Leiman Bros., Newark, N. J. Catalog contains performance curves and specification tables on their 4-wing and 2-wing type air pumps and accessories. Pumps are rotary positive type, designed for producing vacuums up to 29 in. and pressures up to 25 psi. (83)

ROOF BOLTS AND ACCESSORIES. Booklet 293, published by Bethlehem Steel Co., Bethlehem, Pa., offers a well illustrated description of their line of roof bolts, plates, ties, nuts, wedges and washers. It includes detailed data on sizes, construction and methods of installation. (84)

MAGNETIC SEPARATOR. If removal of tramp iron, concentration of magnetic substances from associated non-magnetics, purification of product from contaminating iron, reclamation of iron from foundry refuse, slag or sand, or scrap separation, is causing you trouble, you may want to take a look at this 8-page catalog put out by Dings Magnetic Separator Co. It describes and illustrates the application, operation and design of the Dings Non-Electric, Alnico Perma-Drum magnetic separator. (85)

JIG. The "how" and "why" of the operation of the selective mineral jig are fully and clearly answered in a 16-page booklet issued by Denver Equipment Co., Denver, Colo. Included with explanations, information and testimonials are specifications and interesting applications. (86)

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Memos from the Manufacturers

- **Newly-formed Rem-Cru Titanium, Inc.** (to manufacture titanium and titanium alloys) will have President C. K. Davis of Remington Arms as chairman of the board. Crucible Steel's W. H. Colvin, Jr., will be president.

- **Expansion note:** Flexible Tubing moves into its new Guilford (Conn.) plant on Nov. 15.

- **For better products and processes:** Raybestos Manhattan has installed the world's largest dynamometer for testing friction material such as brake lining and dutch-facings. Peerless Pumps is justly proud of its new $250,000 testing laboratory.

- **American Iron & Steel Institute** statistical report that only 38% of total shipments in 1943 went to direct war uses.

- **Large scale production** of gas turbines has become an immediate prospect. General Electric is spending $4 million for plant facilities.

- **Caterpillar Tractor Co.** has formed a British subsidiary to handle British-made Caterpillar parts for company's dealers in the UK and nearby countries.

Gould-National Batteries, Inc. is the name of the **National Battery Co.** which purchased the **Gould Storage Battery Co.** recently.

Traylor Engineering & Mfg. Co. has appointed **Joseph M. Wolfe** as assistant to the chief engineer.

Euclid Road Machinery Co. has named **Foulger Equipment Co.** its distributor for Utah, southwestern Wyoming and northeastern Nevada.

Lester E. Reeve has joined **Mack Trucks, Inc.** as special assistant to the president.

Donald M. Russell has been elected a director of each of **Four Wheel Drive Auto Co.**'s two subsidiaries, **Eagle Mfg. Co.** and **F.W.D. Auto Co., Ltd. (Ontario).**

Straub Mfg. Co. has made **Migula & Co.** its representative for Kue-Ken crushers in southern California.

Quimby Pump Div. of **H. K. Porter Co., Inc.**, has been sold to **Warren Steam Pump Co., Inc.**

Floyd Monteith and **Robert Karakoosh** are now representatives working out of **Kennametal, Inc.'s.** Chicago and Springfield offices respectively. **William Collins** and **Harold D. Killmer** have been appointed service engineers in the Springfield office.

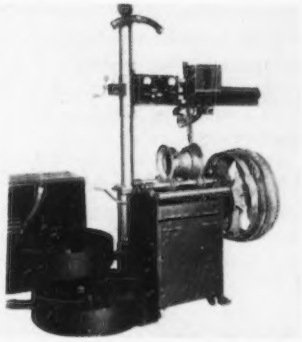
New manager of the Seattle branch of **Crucible Steel Company of America** is **David R. Meslang.**

W. Samuel Carpenter III is now assistant manager of **duPont Co.'s** Rayon Dept., Planning. Div.

John C. H. Wendes has taken over as production manager of the Naugatuck Chemical Div., **U. S. Rubber Co.** and **Joseph P. Monahan** is general control manager.

Recent appointments in the **Hyster Co.** sales dept. include **Harold R. Lucas, Jr.**, as assistant to the general sales manager and **Henry Benit** in charge of Hyster grid roller demonstrations.

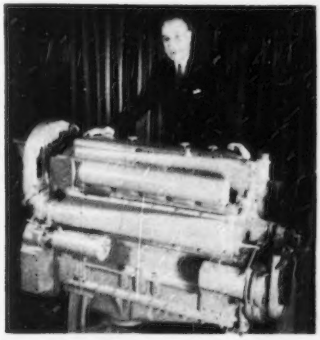
Courtland F. Carrier has been named technical adviser of the fabricating division of Western Brass Mills Div. of **Olin Industries, Inc.**



AUTOMATIC WELDING MACHINE employs 500-amp. ac. welder, accommodates work mounted at any angle for welding, hard-facing. Leader Welding & Mfg. Co. (13)

INTERCOM SYSTEM automatically supplies enough power to overcome noise level on any intercom station in mine or plant. Eliminates boosters. Talk-A-Phone Co., Chicago. (14)

FEEDER is now available in lengths up to 60 ft., 72 in. wide. Corrugated, overlapping pans and other wearing parts are cast manganese steel. Pioneer Engineering Works. (15)



DIESEL ENGINE compact, lightweight rates 275 hp. on 6 cylinders, each having a 110-in. displacement. Detroit Diesel Engine Div., General Motors, Detroit, Mich. (16)

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New Mexico *(Continued)*

$7.78. The reduction was secured through the efforts of the recently formed New Mexico Freight Rate Bureau.

OREGON

★**Development work has been under way** during the summer at the Buffalo mine in Grant County where veins will be explored at depth of tunneling.

★According to Fayette I. Bristol, president of Oregon Mining Association, **high-grade chrome ore can be produced by Oregon** and northern California mines if it is needed for war, if the Government will pay premium prices. Mr. Bristol reports there are about 350 chrome mines and prospects in the areas mentioned. Most of these are on high ridges and the development work is very expensive.

★**The Nickel Mountain deposit,** near Riddle, in Douglas County, which was explored by diamond drilling in World War II by the Freeport Sulphur Co. which opened a big supply of low-grade nickel silicate ore, is now under lease to the Hanna Development Co. The ore is being tested in the company's research laboratory to determine whether development work would be profitable.

★**A new use is being developed for perlite ore,** which exists in abundance in eastern Oregon. Pacific Stoneware Co., Portland, has been making tests on use of the ore as a substitute for feldspar in a ceramic glaze on stoneware jars. First tests had satisfactory results.

★H. C. Burnham of Fairview, Earl Stanley of Gresham and Walter Brown of Baker **have purchased the Jay Gould mine** in Baker County. A development program has been started under the supervision of Fred Wickham of Baker.

★**Fire did an estimated $50,000 damage** to the Oregon King mine in Jefferson County Aug. 2. Oregon King is one of Oregon's largest gold diggings. The mine had been inactive since the end of the war, but underground rehabilitation work had been started.

★**Powder River Dredging Co.,** a new corporation, has purchased the Baker Dredging Co.'s 9-cu. ft. Sumpter Valley dredge and will work new ground in the lower end of Sumpter Valley.

★Kenneth Watkins, Disston, has **leased the Champion mine and mill** in Bohemia district and is working it with a force of 20 men. A shipment of concentrates has been made to the Tacoma smelter.

★**About 900 tons of limonite ore have been shipped** from a pit near Scappoose to the C. K. Williams Co. pigment plant at Emeryville, Calif. The pit producing the limonite is owned by

Columbia County. Orrin Peterson, engineer for the company, directed the work. These shipments have been made annually since 1945.

UTAH

★**New Park Mining Co. has secured leases on 28 uranium claims** in the Circle Cliffs area of Garfield County, Utah. W. H. H. Cranmer, president of New Park, reported contractors have been engaged to develop an open-pit mine at the properties, located 43 miles south and east of Escalante. The objective is exploration for carnotite and torbernite uranium ores. Leases were acquired from Fred Hinds of Marysvale, representing a number of claim holders.

★Adding to activity in the Park City district, officials of the Park Utah Consolidated Mines Co. announced on August 25 that **exploration of several fissures in the Judge unit** and extensive development is underway at the company's Keetley unit. Shipments to smelters of about 3,500 tons a month from both fissured and bedded ore deposits at the Keetley unit would begin soon.

Development at Keetley is to include shaft sinking to the 1,800-ft. level, where it is hoped further bedded deposits of lead-silver-zinc ores can be located. Thus far at Keetley, three separate but irregular bedded orebodies were located in the past 12 months. The ore runs through from the 1,500 to 1,700-ft. levels, according to reports. Mr. Hunt, general manager, noted that, while estimates of the reserves are difficult to make, each of the three bedded orebodies might run from 50,000 to 65,000 tons.

Signs that such bodies may likewise exist below the 700 through the 1,800-ft. level have resulted in plans for the new shaft, according to Mr. Hunt.

At the Judge unit, plans have been made to explore known fissures to the south on two levels, and another fissure to the southwest for new shows of ore. In addition, short drifts will be driven on outcrops elsewhere in the Judge.

★The Utah State Supreme Court on August 24 unanimously **upheld a State Tax Commission claim against the Kennecott Copper Corp.** involving approximately $1 million the commission claimed was owing in back corporation franchise taxes.

Only $210,000 was involved in the original 1942 tax case, but application of the new court decision to subsequent years is expected to raise the amount of necessary payments to the $1-million mark. One major issue involved was over methods of determining a depletion allowance which is deductible from net income for state corporation tax purposes. The company had maintained federal taxes should not be deducted from net income until the 33⅓% depreciation

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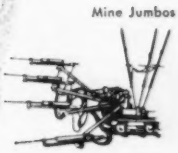

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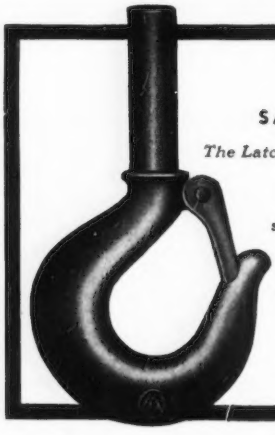

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Utah (*Continued*)

deduction was computed. The commission, now upheld by the State Court, stated federal taxes should be deducted before the depreciation allowance was computed. Under the company theory, its 1942 taxable net income was $5,803,351 in 1942. Under the state court ruling, its taxable income that year was $12,916,734.

★**All three major mines in Utah's Park City district** have resumed work, and a 48-day strike affecting USSR&M Co. operations at Lark, Bingham, and Midvale has ended.

The New Park Mining Co. initialed contracts with the CIO United Steelworkers in early August. However, the important break in the long stalemate came on August 23 with word that members of the Steelworkers' Park City local 4264 had voted acceptance of new contracts with Park City Consolidated.

A joint statement by Park Utah president Paul H. Hunt and CIO officials noted that the contracts called for a 5c. per hr. wage increase. Work at the company's Keetley unit, which had operated during the pricing shutdowns, resumed immediately, but a week was needed to organize crews for operation of the Judge unit, closed over a year. Terms of the agreement were "substantially those of the Tintic district agreement," according to the joint statement.

Silver King Coalition Mines Co. contract likewise included a 5c. per hr. pay increase. Active operations on the Silver Hill unit of Silver King began at once. Mining at the west end of the properties will be delayed until these sections are dewatered.

Further clarifying the Utah labor picture, the United Steelworkers of America settled their 48-day strike against properties of the United States Smelting, Refining & Mining Co. on Aug. 17. This settlement included a 5c. per hr. increase for 1,200 company men at mines and smelters at Lark, Bingham and Midvale. An overtime rate for holidays and a rate of 2½c. per hr. per employee to be applied to employee social insurance were also approved. Daniel Edwards, mediator of the Utah Labor Relations Board also announced that a general pension plan is being drawn up, with details not as yet announced.

WASHINGTON

★In June, **Washington produced 800 tons of lead** according to the U. S. Bureau of Mines. This compared with 975 tons in May, and the monthly average for 1949 of 535 tons. Zinc production amounted to 1,200 tons in June compared with 1,215 tons in May and the 1949 monthly average of 895 tons.

★Lee Eller and John Sims are incorporators of **Modern Gold Dredging Co.**

of Spokane. Capital for the company which was listed at Olympia in August is $300,000.

★**Columbia Lead & Zinc Mining Co.** is drifting and raising at its property in the Metaline district, according to H. S. Johnston of Spokane, secretary-treasurer. The ore will be stockpiled for shipment to a custom mill. Everett Hougland of Republic is superintendent of operations.

★**Sunny Peak Mining Co. has been retimbering the Mohawk tunnel** at its Conconully gold property, according to C. L. Butler, Spokane mining engineer. The ore will be trucked to Omak. The Gubser tunnel, at creek level, which is said to have 27 known veins, will be retimbered for 880 ft. and extended 60 ft. to reach a new vein.

★**Pacific Northwest Alloys Co.** which makes ferrosilicon and ferrochrome, strategic materials for the nation's steel industry, at the wartime Mead magnesium plant, north of Spokane, began operating its third electric furnace Aug. 29, and expected to start its fourth furnace about the middle of September, according to W. T. McGinnis, manager. This doubling of production which had been planned for more than a year was made possible by the allocation of additional power by the Bonneville Power Administration. According to Mr. McGinnis, there has been an increased demand for ferro-alloys since the Korean War.

★**A diamond drilling program is under way** to determine the extent of the tungsten deposits at the property of Columbia Tungsten Corp. in Stevens County, according to E. H. Jamieson, president. The scheelite and wolframite occur in quartz veins in granite in a mineralized zone 30 to 60 ft. wide. Transverse drilling at 50-ft. intervals will be used to determine the widths of the quartz veins, followed by longitudinal drilling for length.

★**Sullivan Mining Co. which is opening a zinc-lead orebody** in ground of Metaline Mining & Leasing Co., which holds a lease on the Contact property, have an operating agreement under which the raise is being driven from the river tunnel of Metaline Mining & Leasing. Sterling Zinc-Lead Co. had started the work but a 400-ft. extension was necessary before the raise could be started.

★In August, a building permit was issued to Kaiser Aluminum & Chemical Corp. for a building to house an oven which will **supply the seventh potline now being built at the Mead reduction plant.** The carbon-baking building will be a quarter of a mile long and 80 ft. wide. Officials said if power had been available, two more potlines could have gone in at Mead.

According to the Kaiser company's annual report, 4,600 acres of ground have been purchased in Jamaica "after the proving up of bauxite deposits" so the Mead plant may eventually produce aluminum from Jamaican ore.

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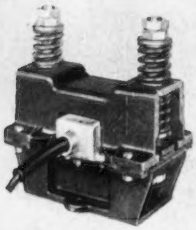

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IN CANADA

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ONTARIO

★Leitch Gold Mines continues to get good results in the development of its three main veins on the new deep levels below the diabase sill. This modest but steady Beardmore area producer, still tops in recovery per ton among Canadian gold mines, is having an excellent year.

It will be recalled that Leitch's ore was cut off at the 15th level by barren diabase. However, the interruption proved to be only temporary, and each of the 17th, 18th and 19th levels (the latter being the mine's deepest at 2,875 ft.) have been showing ore typical of shallower horizons. The mill continues to handle close to 90 tons per day, with heads averaging close to 0.90 oz. per ton.

New this year is a long crosscut being driven on the 8th level toward the adjoining Halport claims, acquired in 1944 but not yet explored underground. Surface drilling a couple of years ago gave encouragement, with good values disclosed along a quarter-mile zone. The crosscut which will be close to half a mile in length, will not reach the favorable area until some time next year.

★The big shaft-deepening job has been completed by Madsen Red Lake Gold Mines, and development will shortly be in progress on the new deep horizons. The bottom level will be the 18th at 9,950 ft., but initial work will be concentrated on the 12th, 13th, 14th and 15th levels. No ore news is to be expected before next March, however, as close to 1,000 ft. of crosscutting will be needed.

Meanwhile this veteran Red Lake area mine continues to mill 800 tons of ore daily, and in the first six months of 1950 produced $1.2 million compared with $842,000 in the corresponding period of 1949.

★Operating profits in the vicinity of $70,000 monthly continue to pile up for Silver-Miller Mines, and the company has already declared its third dividend. Payments are established at 3c. quarterly.

Production in July was 140,877 oz., of which approximately 81,000 oz. came from the milling of 1,505 tons; the remaining 60,000 oz. being obtained from high-grade ore that was bagged and shipped direct to the Deloro smelter. Net profits in the quarter ended July 31 were 8c per share.

★Another old silver veteran to revive is the Haultain property in Gowganda. The mine, some two miles east of Siscoe Metals, has been taken over by Roy Silver Mines, recently organized and financed by the same interests that sponsored the revival of Silver-Miller in Cobalt. A new road is being put in, and the old workings are to be dewatered this fall. The property has been closed for many years, no work having been done since low silver prices forced suspension of operations away back in the twenties.

★New Dickenson Mines, young Red Lake gold producer, continues to make production and profits records. Output in July was $86,499 from 4,285 tons, versus $59,102 from 3,969 tons in June. Profits in July were more than double the $25,145 earned in the previous month, which in its turn had set an all-time record.

★One of New Dickenson's younger neighbors has been pleasing its sponsors, too. Marcus Gold Mine, busy with surface drilling, has had encouraging ore indication, with intersections in three holes showing typical ore mineralization and values along a length of 200 ft. Structural conditions are reported similar to those of Campbell Red Lake and New Dickenson, both close by.

★First underground work at the Montreal River property of Ranwick Uranium Mines has disclosed five ore shoots, with the downward extension of the main surface showing still 150 ft. ahead of the adit face. Total length of the five is somewhat more than 125 ft., and mining widths are expected to average close to 50 ft.

★More than 44% of all Renabie Mines' lateral work during the first half of 1950 was in ore. This Macassa-controlled gold mine, first in the Missinaibi area, should show a substantial increase in ore reserves at year end, as development of both the "D" and "E" orebodies has been highly encouraging. On the 800-ft. level the "D" shows 1,000 tons of ore per vertical foot, with grade running more than 20% above mine average.

QUEBEC

★Gold production and profits of Malartic Gold Fields should reach all-time highs this year, yet the mine will probably start 1951 with larger ore reserves than ever before. Gold output can be expected to exceed $4 million

to place the company in seventh place among the straight Canadian gold mines, while reserves could exceed five million tons, more than eight years' supply.

This Malartic area producer has now worked its way comfortably out of the woods in which it became entangled during its expansion struggles. The mill is handling close to 1,700 tons daily, profits are running ahead of the 18.8c per share earned in 1949, and bank loans have been erased in favor of a strong cash position. Dividends appear to be a good possibility for 1951.

★Barnat Mines, developing Malartic's newest gold mines in the former National section of its property, is making good headway in unfolding the complex pattern of its North Zone ore. Assured ore reserves exceed 500,000 tons, with possibly double that amount indicated in addition. The No. 3 shaft, to become the main production opening, has been deepened to 1,450 ft., and exploration will soon be started on four new levels; three above and one below the present bottom horizon at 1,250 ft.

★Ore development is starting on the two new deep levels of Lake Wasa Mining Corp. in Beauchastel twp. Located at 800 and 1,000 ft., these levels were established after completion of shaft-deepening early this summer. Indicated ore above the three upper levels is estimated at 1.9 million tons averaging 0.151 oz. gold per ton, and it is believed from the previous drilling that the ore on the new horizons may prove to be slightly higher in grade.

★Aided by higher copper prices, Quemont Mining Corp. is making good progress in reducing the debt with which it reached the production stage in 1949. Profits have mounted in each quarter of 1950 and are now close to an annual rate of $4 per share. At the end of 1949 the debt stood at $6.9 million. This had been reduced to $5.6 million by the end of May, and it is expected that early 1951 will see it entirely cleaned off. As a strong cash position will then be built up quickly, it is possible that dividends may be initiated some time late next year.

★First development work on the new block of ground being explored at depth by Normetal Mining Corp. has given results that appear to be quite up to mine standards, though the amount of work done is insufficient to permit accurate appraisal. Only two levels have attacked so far; one at 3,390 ft., and the other—the mine's deepest—at 4,165 ft. The intervening block of 775 ft. has been left untouched. Good sections of copper-zinc ore have been found at each horizon.

★With gold production expected to

BETTER AND BETTER

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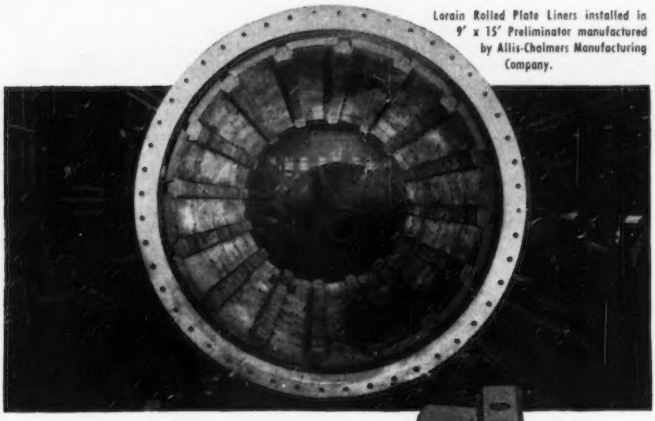

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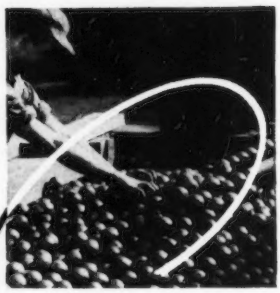
U·S·S Lorain Rolled Plate Linings are available through leading mill manufacturers whose names will be furnished upon request.



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LORAIN ROLLED PLATE LININGS AND U·S·S GRINDING BALLS

USS

UNITED STATES STEEL

Quebec (*Continued*)

start early in 1950, Donalda Mines is making steady progress in the building of its 350-ton mill in the Rouyn area. The mine is already an established producer, having been a regular shipper to the nearby Powell Rouyn mill since late in 1948. In the first six months of 1950 shipments totaled 45,005 tons for gross recovery of $318,425, and it is expected that shipments will continue until the company's own mill is ready for operation. Ore reserves are calculated at sufficient for three years' milling above the 655-ft. level.

★Kayrand Mining & Development Co. has met with considerable encouragement in its surface drilling this season. An extensive zone of copper and zinc mineralization, with values in gold and silver as well, has been indicated at its Merrill Island property in Chibougamau. Consideration will possibly be given this winter to underground work.

★Another company drilling in the same area is Merrill Island Mining Corp., formed this year to acquire the Merrill Island properties of Blake Chibougamau Mining Corp. Previous drilling on the main group indicated about 1 million tons of approximately 2% copper content. The new company is strongly financed, with approximately $250,000 supplied for initial exploration.

★Net profits of Noranda Mines reached a new top in the second quarter of 1950 at $1.60 per share. The previous high was registered in the opening quarter of 1949, when $1.56 per share was rung up in the company's cash register.

The good showing this year is being made in spite of lowered investment income. While Anglo-Huronian, Aunor, Hallner, Kerr-Addison, and Proprietary raised their dividends, Waite Amulet has paid less. Waite is going through a period of slimming reserves and higher costs, and Noranda holds 2.2 million shares. Its dividend from that source in the first half of this year was reduced to $1.2 million from $1.7 million during the preceding year.

LABRADOR

★Exploration work on the iron deposits being developed by Iron Ore Company of Canada under its options from Hollinger North Shore and Labrador Mining & Exploration Co. has brought good results again this season. It is expected that the year-end will see the ore total raised to 400 million tons from the 360 million tons reported at the close of 1949.

While nothing official has been reported about the progress of production plans, it is expected that a start will be made this winter on the 260-mile railway from the ore fields to the

St. Lawrence River. Much of the preliminary survey work is already completed.

MANITOBA

★**Hudson Bay Mining and Smelting Co. Ltd. reports estimated net earnings** for the months ending June 30, 1950, as $6,551,998, equivalent to $2.38 per share. The new zinc plant which will deal with current ore as well as 900,000 tons of stockpiled material, is expected to be in operation next January. The company's extra zinc will bring total output up to 130 million lb. a year.

The company has made progress in metallurgy at Manitoba Chromium Ltd. and good chromium can be made. However, under present conditions the property could not compete with European supplies.

★**Ogama-Rockland Gold Mines Ltd. reports the July output** at $44,300, bringing the seven-month total production to $285,700. Some new ore has been encountered in the No. 4 vein, 200 ft. south of the Ogama vein. A program of deep diamond drilling below the bottom level has started. If this work picks up ore values, Ogama will sink the shaft deeper. Exploration has been carried on to the depth limit of present hoisting facilities. In the event of work being carried deeper, sufficient ore could not be secured from existing levels to maintain milling operations pending the development of any deeper ore. Further finances would have to be raised.

★Sherritt Gordon Mines Ltd. reports that second quarter production at the parent mine continued at a slightly higher rate than that of the first quarter. During the first half of the year the company milled 191,470 tons of ore from which were produced 7,945,729 lbs. of copper, 2,329 oz. of gold, 74,046 oz. of silver, and 3,892 tons of zinc concentrate. Net profit was $591,292.

At Lynn Lake, underground development and diamond drilling continued. A new orebody, the "F," was located on the drive south to reach the "B" orebody on the 1,000-ft. level. This new orebody was explored by lateral diamond drilling.

The pilot mill at Lynn Lake resumed operations in June, operating on ore from the "C" orebody and low-grade ore from the "A" orebody. Separate nickel and copper concentrates are being shipped to Ottawa for treatment in the pilot leaching plant.

Construction of a control dam at the outlet of Russell Lake is under way. This will be the main water storage in the Laurie River power development project.

★**The John T. Ryan Trophy** for mines in the Prairie Provinces and the Northwest Territories was awarded to the management and employees of Sherritt Gordon Mines Ltd. on Au-

500 ton per day selective lead-zinc concentrator recently completed by Stearns-Roger at Deming, New Mexico

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Construction view of the flotation building with 30'x 20' thickeners in the foreground

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Manitoba *(Continued)*

gust 5th. The presentation marked the seventh time the award has been won by Sherritt Gordon in eight years.

SASKATCHEWAN

★Nicholson Mines, Ltd. reports drifting continues south of the main ore shoot of No. 4 zone at the company's Lake Athabasca property, with the face rich in pitchblende. Assays over an average length of 176 ft. and width of 4 ft. extending from the surface to the second level, are reported to show 0.85% U_3O_8, or $54 per ton at 70% recovery. The ore shoot is improving with depth.

★Nisto Mines, Ltd.'s underground development at its uranium property at Black Lake will be started by September, the controlling company, Transcontinental Resources, Ltd., announces. A crew is now on the ground and it is planned to press development throughout the winter.

NORTHWEST TERRITORIES

★Giant Yellowknife Gold Mines treated 12,961 tons of ore for a recovery of 8,539 oz. of gold and 2,856 oz. silver, having a gross value of $369,556 in July, compared with recovery of 10,007 oz. gold and 3,264 oz. silver, with a gross value of $387,911, from 12,588 tons in June. Calculated millheads averaged 0.74 oz. gold per ton in July, with average milling rate 418.1 tons daily, compared with calculated millheads averaging 0.87 oz. gold in June, when average milling rate was 419.6 tons daily.

★Salmite Consolidated Mines, Ltd. is expanding its operations on its Yellowknife property. Besides the current 3-drill program, a basic survey system has been laid out and a geological mapping program begun to cover the whole property and correlate all showings.

BRITISH COLUMBIA

★Monthly gold production in B. C. has exceeded that of 1949 for the fifth consecutive month, according to a government statistical report. Output for May was 26,711 oz., compared with 24,469 oz. for the same month in 1949. Total production for the first five months of 1950 is 131,614 fine oz., 4.53% more than the quantity produced during the same period last year.

★Canada's 10-day railway strike threatened to have serious effect on British Columbia's mining industry, but its abrupt end forced by Dominion

legislation passed by an emergency session of Parliament averted any wide-spread layoffs.

★Violamac Mine, at Sandon, which suspended shipping briefly, has now resumed shipping and plans to build a ramp at the Canadian Pacific Railway station to permit loading into gondola cars. Shipping of two cars of ore a week was discontinued because full value was not being received from its zinc, and because loading and unloading operations were too expensive. The firm intends to build a small ball mill to step up zinc value from 18 to 40%. The lower mine tunnel has been driven in 250 ft., with another 700 ft. expected to bring it to orebodies.

★Island Mountain Mines Co. reports production of 1,644.46 fine oz. gold from 3,935 tons of ore milled in July, compared with 1,536.30 oz. gold recovered in June from 3,586 tons of ore.

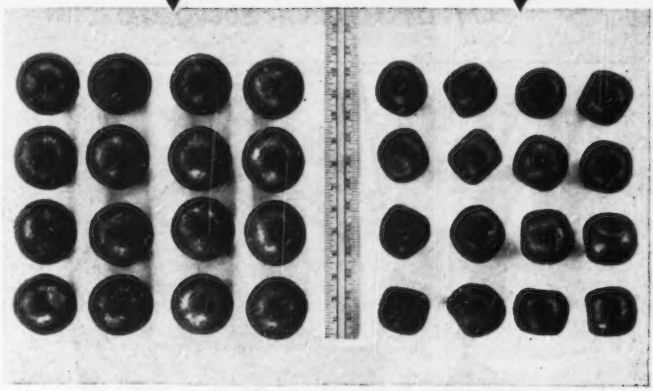
★Improved ore treating facilities at Whitewater mine of Retallack Mines, Slocan, now under Kootenay Belle Gold Mines, have proved successful in recovering zinc values at a profit from tailings at the property. The company has completed agreements with owners of similar dumps in Retallack, Sandon and other adjacent areas for treatment of residues on a royalty basis.

With a month's net profit of $27,000 on a gross output of $51,000 from initial operations in June chalked up, company directors are planning an additional unit for the new sink-float plant at the Whitewater mine. The new unit is expected to be ready by the end of this year or early next spring.

★Noland Mines, operating a gold placer mine on Spruce Creek, reports gold production has risen from $10,561 in January to $49,228 in June. The company is mining out old pillars and concentrating on development work upstream.

★Yale Lead and Zinc Mines, Ainsworth district, is proceeding with plans for production and finances are now being arranged for installation of a concentrator. Plans call for a sink-float plant with daily capacity of 250 tons and a 125-250 ton concentrator behind it to concentrate the ore further. H. D. Forman, mine manager, estimates 201,000 tons averaging 3.1 oz. silver, 5% lead and 5.5% zinc on the Highlander, Albion, Banker, Krao and Black Diamond groups. Drifting in the Highlander adit, which resumed this spring, will continue to get under the Albion and Banker showings. Lowest workings on the latter properties are at an elevation of 500 ft. above Highland, and it is proposed to raise from the Highlander drift to connect with these. All ore mined on the three groups will come out through the Highlander adit. If raises to the Albion and Banker workings show that ore persists down to the Highland elevation, tonnage estimates could be

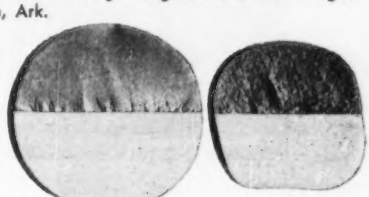
SHEFFIELD MOLY-COP COPPER-MOLYBDENUM-ALLOY VS. COMPETITIVE FORGED BALLS



THERE *IS* A DIFFERENCE IN FORGED STEEL BALLS

Again, the longer wearing qualities of Sheffield Moly-Cop balls have been demonstrated. This time in a test grinding barite ore at Magnet Cove Barium Corp., Malvern, Ark.

An equal number of Moly-Cop and competitive forged steel balls were charged into the same mill at the same time and were recovered after 4604 operating hours. All were originally 3½ inch nominal diameter and marked for identification.



MOLY-COP COMPETITIVE BALL

The recovered test balls are shown in the top photograph. Clearly evident is the difference in rate of wear. The *competitive forged balls* wore 38% *faster,* based on average diameter loss. Note also the pronounced difference in retention of spherical shape.

Typical fractures of the two types of test balls are shown in the lower photograph. Note the fine, hard, martensitic grain structure of the Moly-Cop ball.

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British Columbia (*Continued*)

added to substantially. Highlander drifting opened 500 ft of milling grade ore last year. Holdings of Yale Lead and Zinc consists of more than 30 properties in the Ainsworth district, some of which have been worked periodically over 50 years.

★Mindus Corp. states work is proceeding on its Promistora Gold Mines group in the Slocan district, about 80 mi. from Trail. Crews are following up the discovery late last fall of a probable ore zone of 800 ft. in which continuous trenching and examination for a length of 55 ft. returned gold values of $28.92 cut grade over a width of 28 in.

★First major obstacle in the establishment of a $500-million aluminum industry in British Columbia by Aluminum Co. of Canada has been removed with the announcement of company engineers that a suitable main damsite has been proved up at Nechako Canyon in Tweedsmuir Park.

★Western Uranium Cobalt Mines, Ltd. is adding copper to its development plans for its properties near New Hazelton. In addition to carrying forward systematic development of its original claims to establish tonnage of ore carrying uranium, cobalt and gold the company has completed a preliminary engineering study of the adjoining Rocher de Boule mine which was optioned recently. The study shows that the Rocher de Boule mine, a former producer carrying values in copper with some gold and silver, has copper showings well in excess of values required for an attractive prospect, and that there is considerable tonnage of milling ore in the old workings, with hydro potential adequate for all operating requirements.

★Silver Standard Mines, Ltd., New Hazelton, has opened the first 30 ft. of an entirely new oreshoot on the bottom level at 1,300-ft. elevation as a result of further exploration of No. 6 vein. In this distance the ore widened from 1 to 5 ft. and values were found to be of medium grade. June millheads came 47% from No. 6 vein and the over-all average for the month exceeded the objective of $100 per ton. During the first quarter of the current fiscal year, the three months ending June 30, progress was reflected in metals production of $406,666. Operating profit was $183,408 for the quarter.

★Customs ore shipped to Trail smelter of Consolidated Mining & Smelting Co. of Canada for the four-week period ending Aug. 5 totaled 22,915 net tons, of which 13,218 went to the lead plant and 9,697 to the zinc plant.

★Production at the Indian Mines (1946) Ltd. property, gold-silver-lead-zinc operation in the Portland Canal district appears assured with the ratification by shareholders of an agree-

Metal Production in Canada
(in thousands of dollars)

Metal	1948	1949
Arsenic	83	....
Bismuth	480	424
Calcium	1,723	634
Cobalt	2,029	913
Copper	107,160	104,799
Gold	123,536	147,739
Iron Ore	7,488	18,315
Lead	60,344	49,823
Magnesium	*	*
Molybdenite	137	....
Nickel	86,904	99,083
Paladium, etc.	6,295	9,247
Platinum	10,623	11,417
Selenium	782	804
Silver	12,082	12,576
Tellurium	20	94
Tungsten	1,046	....
Zinc	65,238	76,534
Others	2,264	2,432
Totals	488,234	534,834

*Not available.

ment with Silbak-Premier Mines, Ltd. under which the latter company is to mine ore and ship about 100 tons daily to its mill 2 mi. away by tramline to be constructed immediately. Under the agreement, Indian Mines puts $50,000 in a trust account controlled by Silbak. The money already has been received by Indian and Canwest Investments Ltd. for 500,000 shares of capital stock.

★Clyde Reeder, Spokane, mining contractor, has been left all the mining property of Columbia Gypsum Products, Inc., 4 mi. east of Windermere. Open-pit methods are expected to result in low extraction costs.

★Maintaining its position as second largest gold producer in British Columbia, Kelowna Exploration Co., Ltd. recovered from its Nickel Plate mine operations at Hedley 43,206 oz. gold, 6,907 oz. silver and 208,633 lb. copper from 121,732 tons of ore milled in 1949. The company's concentrator treated an average of 335 tons daily, with operations continuous throughout the year except for a one-week strike of employees in October.

★Proposal to form a new company tentatively called Privateer Mines (1950) Ltd. to finance to production the Vancouver Island property of Tofino Mines has been left in the air by a special meeting of shareholders of Privateer Mines, Ltd.

★Thomas Consolidated Mines, Inc. of Spokane has purchased the War Horse mine in British Columbia near the Sullivan mine of Consolidated Mining & Smelting Co. Secretary-treasurer David E. Watson of Thomas Consolidated says certain possibilities still exist on the Thomas group, but the War Horse offers a better potential profit.

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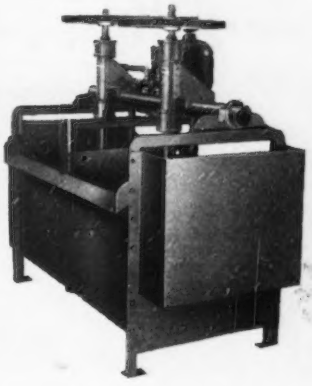

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AGENTS IN ALL PRINCIPAL FOREIGN MINING DISTRICTS

IN LATIN AMERICA

- Strikes Plague Chile
- Mexico Finds Manganese

CHILE

★**Andes Copper Co.** was closed by a strike early in September. The walkout was illegal, and the Government sent troops from Copiapo to keep order at the mine and the Barquito power plant. The power plant crew at Tocopilla, source of Chuquicamata's power, also struck early in September, demanding higher pay. The Government sent troops to keep the plant running.

★**Cia. Minera Punitaqui** was also closed by a strike. No issue of wages or working conditions existed, but the men walked out because the Chilean Labor Ministry had ousted two union officials for Communist activities.

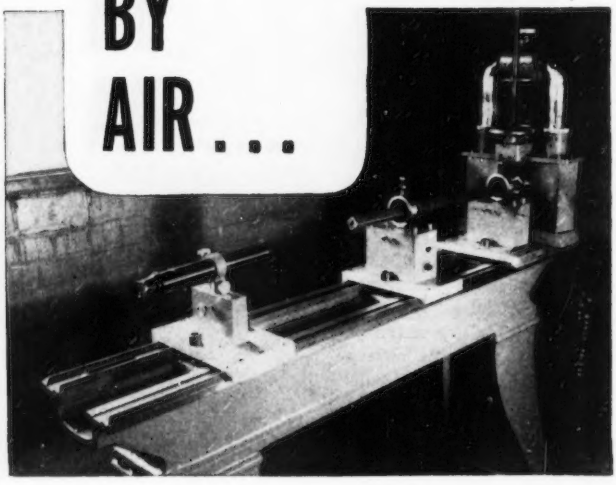
★The two-month strike at **Maria Elena's nitrate** fields cost the Chilean budget about $1,900,000 in foreign exchange.

★**Shipments of copper** for the first half of 1950 totaled 129,252 metric tons, far below normal. Almost continuous labor troubles have been largely responsible for the decline. In 1949, Chile produced 351,315 metric tons of copper of all types, with Chuqui providing 49.8%, Braden, 36.1%, and Andes, 14.1%. The United States took the greater part of this copper, with France, Great Britain, and Brazil coming next.

MEXICO

★Mining men in Mexico **take a dim view** of the industry's future there unless the Government successfully negotiates another trade treaty with the United States for 1951. They figure their loss, lacking a treaty, will amount to about $7,510,000. On the other hand, the Government hopes to see increased exports of lead and zinc, which it feels will compensate for loss of markets. Unless the treaty is extended, mining men feel the Government will have to help industry by cutting taxes and rail freight rates. Right now, there isn't much hope of cutting either one. The

ORDEAL BY AIR...



The machine shown here is a Pneumatic Fatigue Tester, developed by Atlas Steels Limited in collaboration with the General Electric Company, and used for measuring the ability of Atlas hollow drill steel to resist fatigue stresses similar to those imposed by mine service. Air pressure vibrates the test bar at the rate of 9000-12000 vibrations per minute, setting up high surface stresses. The breaking of standard grade bars under these controlled conditions provides useful data on the characteristics of the steel and permits closer mill control of current production.

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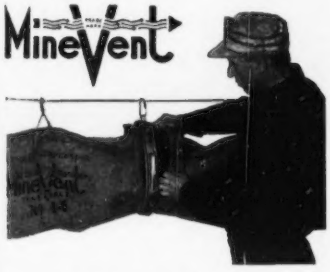

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WARSAW, INDIANA

Government says high taxes and high freight rates are needed to keep both the Government, and the trains, running.

★Government geologists headed by Raul de la Pena and Genaro Gonzales Reina, have found **manganese orebodies** in the Mixteca district of Oaxaca. Conferences between de la Pena, who is director of the National Institute for Investigation of Mineral Resources, and the Oaxaca Government, will determine who is to exploit the deposits.

★**Cia. Explotadora Minera, SA,** has acquired the San Dimas mine in Durango and the San Ignacio mine in Sinaloa, both former producers of silver and lead.

★About **400 small miners** in Nuevo Leon have, with Government help, organized a mining bank to finance development and exploration.

BRAZIL

★**Growing interest of German steel industry** in the Itabira iron ore may spur the reorganization of the Cia. Vale de Rio Doce. The Germans are not interested in negotiating for the small lots the present operation produces.

Meanwhile, the Brazilian government remains cool to the company's claim that all it needs is a few more millions to get over the hump. But it also is opposed to other proposals to allow private capital into the company, which might take it out of the government agency's control.

AUSTRALIA

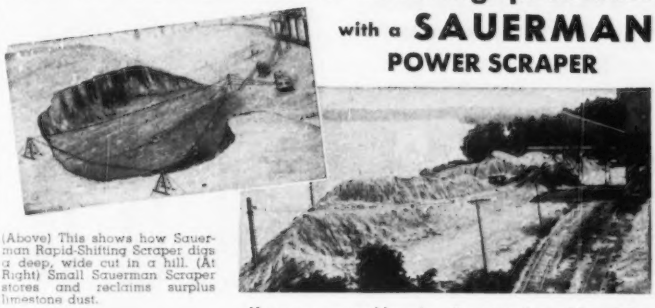
- Gold Still Lags
- Lead Price Hurts

★Although **the profit outlook** for the Australian metal mining industry has been brightened by the upward movement of metal prices in the wake of the Korean crisis, the industry is doubtful of its ability to take advantage of the higher prices on an increased volume of production. Shortages of manpower and equipment are preventing a rapid production response to the improved earning opportunities.

The lack of elasticity in Australian mining is well illustrated by the latest statistics on **gold production.** While many mines are reporting record profits due to the 44% premium on the Australian gold prices resulting from last September's devaluation, hopes for a greater physical volume of production from formerly marginal orebodies have not materialized. On the contrary, since December last year, returns have been lower each month than in the corresponding

how to solve varied handling problems

with a SAUERMAN POWER SCRAPER



(Above) This shows how Sauerman Rapid-Shifting Scraper digs a deep, wide cut in a hill. (At Right) Small Sauerman Scraper stores and reclaims surplus limestone dust.

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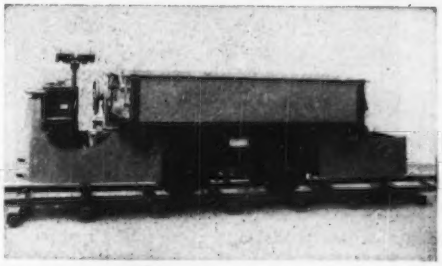

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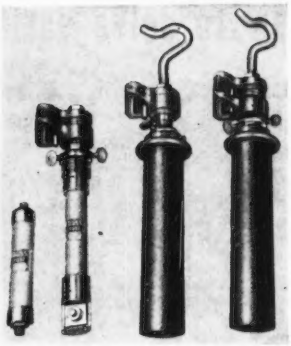
MESCO
Clamp Type Trolley Tap



The Mesco Trolley Tap No. 1059 is equipped with grooved jaws which grip trolley wires firmly and give 2¾ inches of positive electrical contact. This feature is a definite advantage where power is needed in one locality for a period of time.

Jaws are actuated by an Acme thread which cuts through dirt and rock dust. When jaws are closed on the wire, a quick twist of the trolley tap locks threads so that jaws will not loosen unless tap is turned in opposite direction. Clamps are also available for use on bare feeder cables from 250,000 CM to 1,000,000 CM. Fuse holder takes either stud type fuse (illustrated) or ferrule type one time powder packed fuses.

For information, see your nearest distributor or write direct

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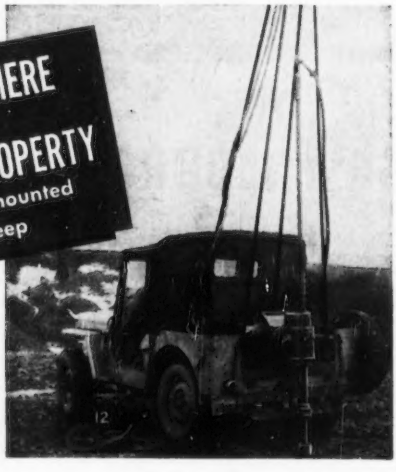

The new Acker Teredo is light, so compact, so simple that it can be mounted easily on truck or jeep and driven by separate motor or power take-off. Small as it is, the Teredo is a high capacity, fast-operating unit capable of extracting cores up to 2 3/16" in diameter and of drilling to depths of 600 feet.

Send for bulletin 3-B-EM.

ACKER DRILL COMPANY INC.
Scranton 3, Penn.

Australia (*Continued*)

months of 1948-49, before devaluation. Production for the first five months of 1950 was 323,130 fine oz., contrasting with 346,107 oz. in the corresponding period of last year.

★The annual report of the Australian Mines and Metals Association points out **certain tariff anomalies** which have been operating against replacement and expansion of mine plant installation where American equipment is required.

Although the margin of British preference under the Australian customs tariff has generally been reduced to 12½% in accordance with the Geneva trade agreements, the margin on mining machinery and winding engines remains as high as 22½ and 25% respectively. Thus the impost on American (and other most favored nations) mining machinery is 30%, compared with 7½% on British machinery, while winding engines are taxed 17½% under the British preferential tariff and 42½% under the most favored nation tariff. Last year's devaluation has accentuated the disparity since Australian import duties are calculated on the f.o.b. value of the goods converted into Australian currency. The effect of devaluation, therefore, has been to increase the effective margin of British preference on all classes of goods and to wipe out the reduction of 2½% to which Australia agreed at Geneva, the report states.

"It is all the harder to understand why the mining industry almost alone of the basic industries of Australia should be denied the benefit of the standard margin of British preference, more especially as in this instance that margin can scarcely be said to be protective of British interests. Metalliferous mining and ore treatment plant has not been developed to any marked degree in the United Kingdom, but has been brought to such a very high standard in the U.S.A. that in most instances mining companies about to install equipment of that kind have no option but to purchase it in America.

"Reduction of the British preference on mining equipment to the standard of 12½% would give considerable relief to the mining industry," the report concludes.

NORTHERN TERRITORY

★**Western Mining Corporation** and **Gold Mines of Kalgoorlie** are investigating the leases of the Lady Claire companies at Tanami. Participation of big mining firms in the development of the Lady Claire leases was foreshadowed some time ago in a report by Mr. M. R. McKeown, consultant to Lady Claire No. 1 and No. 2. The report stated that the field was so extensive and prospects so attractive that it might be deemed wise either to

seek additional capital or to make a portion of the leases available to a powerful concern.

★Technical advisors to **Whippet Consolidated N. L.** consider it unlikely that present reserves of payable ore will provide more than three to four months' crushing. The variable nature of the orebody makes it difficult to assess the remaining tonnage of ore reserves.

WESTERN AUSTRALIA

★**Shortage of labor and materials** has prevented the establishment of new companies to exploit the advantage which the exchange slump of September, 1949, bestowed on the gold mining industry, members of the Chamber of Mines of Western Australia were told at Kalgoorlie recently by its president, J. F. Thorn. At the end of 1949 the 47 member companies employed 5,762 men, compared with 5,519 at the end of 1948. Government statistics quoted in the report indicate that 6,762 men were employed in all gold mines in 1949 and that this was the smallest number since 1945. There were 15,000 men on the payrolls before World War II.

The Chamber of Mines executive council reported that 2,468,297 long tons of ore were treated in the state last year for a yield of 649,572 fine ounces, compared with 2,447,545 long tons and 662,741 fine ounces in 1948.

SOUTH AUSTRALIA

★Recent strengthening of **the international lead price** to the Australian currency equivalent of £120 a ton has accentuated the crisis which has developed over the controlled domestic selling price of £35. The issue was raised in a prominently displayed advertisement by **Broken Hill Associated Smelters Pty., Ltd.,** which appeared in major Australian newspapers before the recent upturn in metal prices.

The company smelts the ore output of the Broken Hill group of mines in New South Wales as well as the residues from the electrolytic zinc plant in Tasmania. The advertisement assailed two anomalies arising from the disparity between domestic and foreign selling prices and from the fact that B.H.A.S. is the only producer of refined lead in Australia.

It called attention to the abnormal increase in the domestic consumption of virgin lead due to the hoarding of secondary lead by speculators. It also took issue with the inequitable distribution of the financial burden involved in subsidizing Australian lead consumption at this prodigal rate. While producers of lead ore outside

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Yes, weigh and record with the
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The Merrick Weightometer provides a continuous, automatic, accurate weight record at any designated point in the mill, while material is in motion on conveyor. It weighs without interrupting conveyor service.

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REQUIRE NO MAINTENANCE

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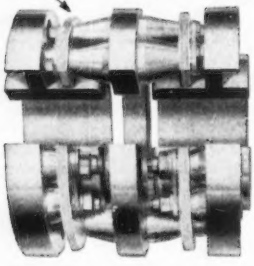

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Australia *(Continued)*

the Broken Hill group were free to export their concentrates at ruling international prices, the Broken Hill mines were compelled to supply the domestic market with refined lead at the official price and to forego the profits which could be earned if the whole of their production could be smelted for export by B.H.A.S.

VICTORIA

★**Gold yield** for the first half of 1950 was 27,195 oz., 5,856 oz. less than for the first six months of 1949. The Minister for Mines, Mr. Thomas, said this result showed clearly that the increase in the Australian gold price due to last year's currency adjustment was insufficient to offset the two main handicaps which were retarding the recovery of gold mining. These were the long-continued shortage of labor and the soaring cost of mining equipment and supplies.

★A new company, **Bendigo Exploration and Gold Development Co. N. L.**, has filed prospectus for a capital issue of £5,000 in contributing shares.

TASMANIA

★With Korean as well as Chinese **tungsten minerals now inaccessible** to the defense industries of the democracies and prices for the world's remaining tungsten ballooning skyhigh, Australia can expect to get enough grubstake out of the boom to develop into a major world supply source.

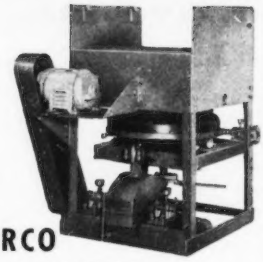
Though wolfram or scheelite are mined in four states and in the Northern Territory, King Island, off the northwest corner of Tasmania, has easily become the dominant factor in Australian production and has the ore resources to become a major world factor as well.

★The deposits are worked by **King Island Scheelite (1947) Ltd.** which succeeded two older companies, King Island Scheelite N. L. and King Island Scheelite Development N. L. The scheelite occurs in garnet-hornfels and garnet-pyroxene-hornfels into which aplite dykes are intruded. The orebody varies in width from 200 to 400 ft. and has a southerly dip of 45 deg. Mining is by open cut for a length of 1,100 ft. along the strike to date. Extensions along the strike are being explored by drilling.

Mining operations began in 1938. An expansion program was carried out after Pearl Harbor with federal government assistance. A treatment plant began to operate in 1944. Research has since enabled the company to improve grade and recovery, but there is still a considerable stockpile of flotation product awaiting further treatment.

RECOVER FREE GOLD

FROM CLOSED GRINDING CIRCUITS



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PLACER JIG

50% to 60% of the free gold passing through your grinding circuit can be recovered by the installation of a Dorrco Pan-American Placer Jig on the ball mill discharge. If you use traps, corduroy or a unit flotation cell at this point, a Dorrco P-A Jig will substantially increase your recovery.

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★Including some wolfram production by **Storey's Creek Tin Mining N. L.** and **Aberfoyle Tin N. L.**, both in Tasmania, and wolfram or scheelite contributed by mainland mines, Australia produced a total of about 1,250 tons of tungsten concentrates in 1949, calculated to 65% WO_3. About two-thirds of this was in scheelite.

★Production of zinc at the **Electrolytic Zinc Company's Risdon works** and output of lead, zinc and copper at its West Coast mines were higher in the year ended June 30 last than in 1948-49. Production of refined zinc set a new record at 83,897 tons, bettering the previous year's record by 1,228 tons. The West Coast mines treated 150,583 tons of ore (126,870 tons in 1948-49) for 9,959 tons of lead concentrate (8,767 tons), 46,299 tons of zinc concentrate (38,974 tons) and 3,889 tons of copper concentrate (3,107 tons).

★Output of **Mt. Lyell Mining & Railway Co., Ltd.**, for the quarter to June 30 showed a considerable improvement over the preceding quarter. This was made possible by an improvement in coke supplies. The blast furnace was in operation for 74 days, compared with only 40 days in January-March. Blister copper production was 2,166 tons, contrasting with 1,158 tons in the first quarter.

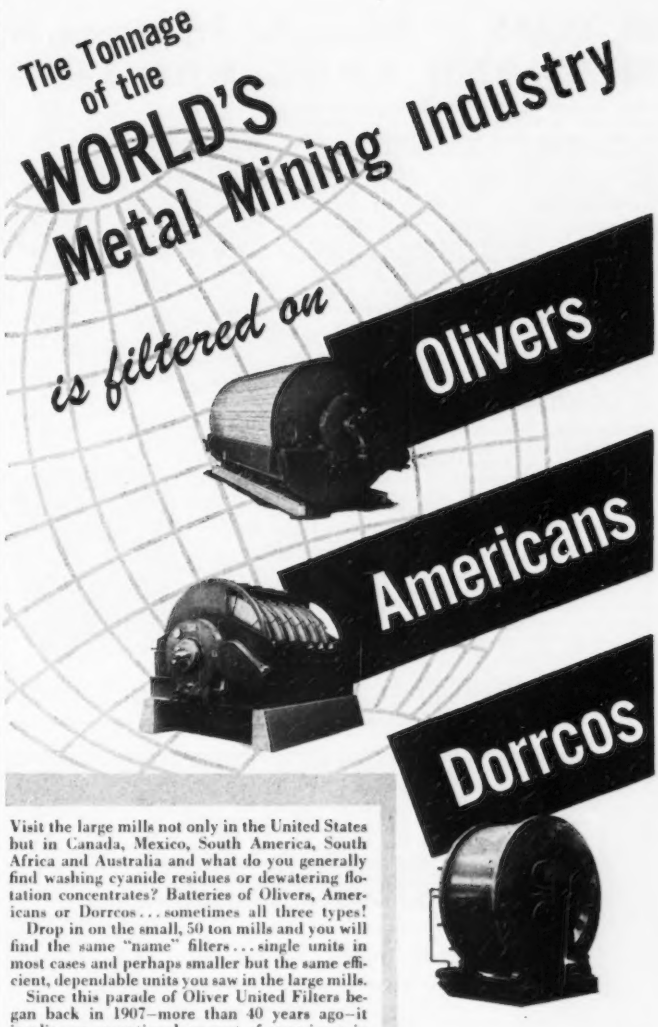
★In the year ended June 30, **Aberfoyle Tin N. L.** crushed 29,568 tons of ore for a recovery of 438 tons of tin concentrates and 116½ tons of wolfram concentrates. This compares with 423 tons of tin concentrates and 90 tons of wolfram concentrates in 1948-49.

NEW SOUTH WALES

★**The higher gold price** resulting from revaluation increased New Occidental Gold Mines' profit from £11,684 in 1948-49 to £96,096 in 1949-50. For the first time since 1946, the company was able to distribute a dividend. In terms of volume, gold production declined from 40,123 oz. to 33,524 oz. Copper production, however, increased from 787 to 796 tons.

★Following a brief strike, **Broken Hill** miners decided by 2,700 votes to 800 to return to work. The decision had been submitted to a secret ballot. The strike settlement involves the admittance of a "reasonable" number of new members to the miners' union. The dispute arose over a request by the companies to the union to admit new members or to agree to overtime work. By attaching qualifications of birth and residence to membership, the union rigorously controlled the intake of new miners on the field, but it has now relaxed these restrictions sufficiently to permit the companies to meet their immediate labor requirements.

★Production by **North Broken Hill**,



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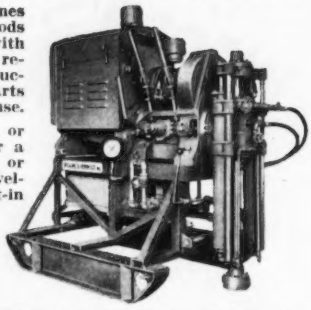

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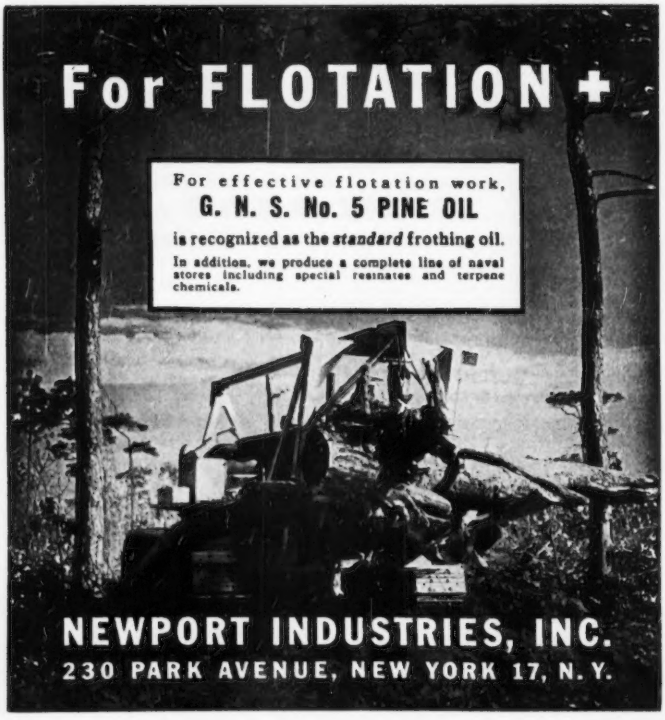
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New South Wales *(Continued)*

Ltd., for the year ended June 30 was slightly higher than in 1948-49. The mill treated 332,305 tons (329,990 tons) for 62,600 tons of lead concentrate (61,967 tons) and 62,239 tons of zinc concentrate (61,932 tons).

★**Broken Hill South, Ltd.**, was able to increase production by a slightly wider margin. The company treated 286,670 tons of ore (264,870 tons) for 47,607 tons of lead concentrate (44,314 tons) and 59,708 tons of zinc concentrate (55,593 tons).

★The continuing spiral of increasing costs is steadily tending to nibble away the benefits of the **increased gold price** due to last year's devaluation, according to Mr. Essington Lewis, chairman of Wellington Alluvials, Ltd. He said in his annual report to stockholders that in 1948-49 it cost £97,612 to dredge 3,310,000 cu. yd., but in 1949-50 the company spent £98,328 in dredging 2,474,000 cu. yd. This meant that the cost per cu. yd. increased from 7.08d to 9.54d, almost wiping out the margin provided by the exchange adjustment. Nevertheless, the company struck a profit of £21,664 (against £14,794 in 1948-49) after providing £14,417 for depreciation. Recovery was 9,547 oz., compared with 11,746 oz. in 1948-49.

★**Production of iron and steel** in Australia, largely confined to New South Wales, showed a slight recovery in 1949-50 after the decline in 1948-49. A total of 1,083,754 tons of pig iron was produced, compared with 1,058,000 in 1948-49, and 1,236,000 tons in 1947-48.

QUEENSLAND

★Profit of **Mount Morgan, Ltd.**, for 1949-50 jumped to £391,447 from £128,494 in 1948-49. The latest profit was struck after providing £71,568 for depreciation and after writing off £42,979 for prospecting and investigation. Also, a windfall profit of £210,000 on sale of gold held for disposal on the eve of devaluation is not included. It was placed to special reserve.

★The recent rise of £35 a ton in the **domestic copper price**, making it £195 a ton, enhances the earning prospects of Queensland copper mines. This is the price paid to producers. The new price to consumers is £215. The difference of £20 is paid into an equalization pool to offset the higher price of imported copper.

★Australia's copper output will probably be doubled when **Mount Isa Mines** opens its new smelting plant next year. This prediction was made in a statement by Mr. R. G. Casey, Minister for Development. Mr. Julius Kruttschnitt, Mount Isa's chairman, said that a new copper mill and smelting plant probably costing more than $4½ million are scheduled to be com-

pleted by the end of 1951. The annual output would be from 15,000 to 18,000 tons of copper.

Total Australian production of refined copper was only 9,437 in 1949, according to the Bureau of Mineral Resources.

The new plant is designed for simultaneous production of blister copper, silver-lead bullion and zinc concentrates. Ore broken by underground primary breakers will be hoisted to the surface and after passing through ore bins will travel on belt conveyors to the mill crushers. The mill will be constructed to treat 36,000 tons of copper sulphide ore per month. The copper concentrates will be roasted in multiple hearth furnaces and the hot calcine then smelted in a large reverberatory furnace fired with pulverized coal. Mount Isa's output for 1949-50 was lower than in the preceding year, showing the effects of the coal strike in the latter half of 1949. The mine produced 32,061 tons of silver-lead bullion (37,155 tons in 1948-49) and 41,742 tons of zinc concentrates (46,529 tons).

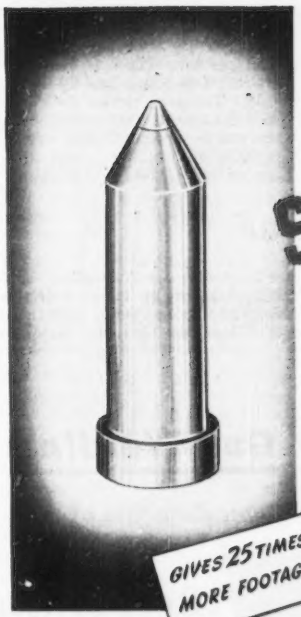
★Contrary to the overall Australian trend, **Queensland's gold production** was 8,296 oz. higher in the first half of 1950 than in the same period of 1949. June yield was 8,431 oz., an increase of 2,042 oz. over June last year. Most of the gold was won by Mount Morgan, Ltd., from copper-gold flotation concentrates.

★A company to be known as **Kingston (Open Cut) Gold Mines, Ltd.**, proposes to work a gold mine by strip methods. It is buying the mine from South Queensland Mines Pty., Ltd. It is located 14 miles from Brisbane.

★The **Queensland Government Mining Journal**, only monthly publication by any Australian state mines department, has marked its fiftieth anniversary with a lavishly produced jubilee number. The issue is introduced with a message from the Hon. E. M. Hanlon, Premier of Queensland, to Australian and overseas business extending a cordial invitation to all to "join us in developing Queensland into the industrial giant that is its natural destiny." Contents range from historical flashbacks to articles of topical and technical interest and include two analyses of the Queensland mining industry by Colin Clark, director of the Queensland Bureau of Industry and econometrist of international repute.

NEW GUINEA

★Production of **Bulolo Gold Dredging, Ltd.**, for the year ended May 31 was 2,396 oz. lower than in the preceding business year. The dredges handled 2,750,000 cu. yd. more material, but this was more than offset by a decrease in grade by 5.42 cents to 18.35 cents per cu. yd. Value of production in 1949-50, at $35.00 per fine ounce, was $2,498,825. Salvage work on No.



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New Guinea *(Continued)*

5 dredge, which capsized several months ago, is proceeding satisfactorily.

★**Gold Mines of New Guinea N. L.** has pegged a claim and applied for exclusive prospecting license over 12,500 acres.

★**Mandated Alluvials, Ltd.**, has plans in hand for development of a copper orebody situated 17 miles from Port Moresby, at Laloki. A similar project was interrupted by the Japanese invasion in 1942. Between 1920 and 1930 another company, **New Guinea Copper Mines, Ltd.**, was active in the same field and at one time employed 1,100 operatives. According to assay reports, the sulphide ore at Laloki averages 4½% copper and 2.8 dwt. gold per ton. There is also oxidized ore of 1¾% copper and up to 15 dwt. gold. The area, which is known as Astrolabe field, was estimated before the war to contain 290,000 tons of ore capable of yielding 13,300 tons of copper and 36,250 oz. of gold.

FIJI

★To dodge an Australian wartime impost, still in operation, on dividends from mining companies operating outside Australia, **Emperor Gold Mines** has been resorting to the expedient of "returning capital" to Australian stockholders. After the next return of capital shares will be down to a nominal value of 1 shilling and the company will be unable to distribute any more profits in this manner. Its sister company, **Loloma Gold Mines**, has overcome the taxation difficulties by investing profits in securities and paying tax-free dividends from dividends received.

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PHILIPPINES

GOLD ACTIVITY in the Philippines centers in Upper Mindanao.

★Production at Lepanto Consolidated was valued at 895,685 pesos in July, from milling 24,950 tons. Operating costs are highly satisfactory, for mining, milling and marketing. Operating profit in June was reported to be 445,000 pesos not including the premium on gold sales which will be paid later to the company. Shipping expense has been reduced on concentrates to Tacoma. The new rate is $7.50 per ton, down from $14.

★Consolidated Mines, operating the Masinloc chromite deposit, shipped 12,335 tons in July. The labor situation continues satisfactory with all work contracted so far as possible. Demand for chromite ore continues strong.

★July production at Atok-Big Wedge was reported at 289,628 pesos at the statutory price, from milling 13,187

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tons. The crosscut on the 10th level of the Keystone vein has cut fair ore across 30 ft. and has not yet exposed the full width of the vein. This is particularly gratifying as it confirms the existence of commercial ore 200 ft. below the previous deepest working level of the mine.

★July outputs at Mindanao Mother Lode and Surigao Consolidated were valued at 262,908 pesos and 204,540 pesos respectively, little changed from previous months.

★Benguet Consolidated is doing better, although mill tonnage has not increased as much as was anticipated. Grade of ore has improved because of cleaner mining. Costs are higher, for labor and supplies have advanced.

★The Manila gold market continues very strong and the price on August 11 had advanced to 115 pesos per oz. The gold price is influenced directly by the price in Hong Kong, where it reflects fear of Communist infiltration. Expressed in dollars, the gold price would probably be about $38.50 per oz., as the "official" peso-dollar relationship of 2:1 has today no real significance.

IN AFRICA

★**Uruwira Minerals, Inc.**, the new lead property in Tanganyika Territory, is now shipping concentrate. Discovered within the last few years by a Belgian geologist, De La Vallee Poussin, the orebody was under option for a time to Union Corporation, the large British gold mining company. A Belgian company is now operating the mine. First shipments of lead concentrate reached Dar Es Salaam early in September for shipment to smelters in Antwerp.

★**Colonial Development Corporation** announced recently in Dar Es Salaam that it is forming a new company, Nyanza Mines, Ltd., to develop the Macalder mine near Lake Victoria in southwest Kenya. The orebody carries copper and gold. Along with geological surveys of the property, pilot plant work will be carried out.

★**Average working costs** in Rand mines reached the high figure of 29s. 6d. per ton in July, according to the Chamber of Mines. Average working cost per oz. of gold rose to 158s. 1d. in July, although the average over the seven months of 1950 is 154s. 7d. Part of this increase is due to inclusion as a working cost the annual assessment to pay claims due under the Silicosis Acts of 1946 and 1950. These were not previously figured as working costs.

★**Virginia Orange Free State Gold Mining Co.**, in which **Kennecott Copper Corp.** is interested, spent £1,493,579 between March 17, 1949, and June 30, 1950. More than £900,000 was spent on shaft sinking, equipment,

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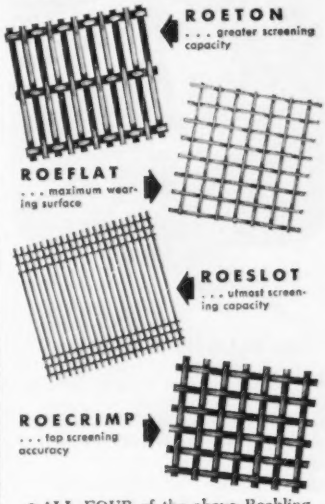

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Africa *(Continued)*

buildings, and surface improvements, and over £514,850 was spent on mining rights. Excavation for two vertical shafts began in October, 1949. Both are down nearly 1,000 ft. Concrete lining is required, and progress has been slow owing to the heavy water flows met.

★The Allied Control Commission in Germany has approved a plan to recruit **100 miners in Western Germany** to work in South Africa gold mines. Recruiting teams from Africa have been rounding up men for some time in Britain, Ireland, Belgium, and Holland. Reason for this intensive hunt for men is that young South Africans show no willingness to go into mining, and skilled miners are getting scarce. The new recruits will be put through the Government Miners' Training Schools before going to work in the mines.

★**The ECA has granted** $1,975,650 to buy earth-moving, mining, and loading equipment in the United States for the Conakry Mining Co. in French West Africa. The company produces iron ore of about 51.5% iron. Shipments are expected to be at the rate of 500,000 metric tons annually by the end of 1952, expanding by 1954 to 3,000,000 tons annually.

ECA is also loaning $2,200,000 to help find more deposits of industrial diamonds in French Equatorial Africa.

★**Devaluation** has helped the Rand gold producers to double their profits during the first half of 1950, compared with the same period last year. The estimated working profit for Rand mines generally was £26,760,040, against £11,323,966, last year at this time. Working costs were up, too. Additional revenue earned by sale of gold abroad in free markets amounted in 1949 to only £99,927.

★**Despite the increased price of gold** due to devaluation, some producers in Southern Rhodesia may have to quit in the face of steadily rising costs. The Chief Government Engineer of Southern Rhodesia has forecast a decline in gold output for 1950 of about 11,000 oz. If present economic conditions persist, it may mean the end of several small mines in Southern Rhodesia.

★**On the Far West Rand,** continuous cementation has held up work on the No. 1 shaft of the West Driefontein gold mine. During the first quarter of 1950, No. 1 shaft was sunk only 169 ft.

★Development work continues on the second to sixth levels north and south of the No. 3 incline shaft at the **St. Helena Gold Mines** in the Orange Free State. Total footage developed during June, showed that over 63% of the drifting had resulted in payable ore.

★**Supplies consumed** by the gold mines of the Rand last year amounted to £47,486,080. All of the South African mining industry spent £60,423,464 for supplies.

★**Copper produced by N' changa** last year totaled 38,751 tons (year ended March 31, 1950), and the accounts show a net profit of £1,531,310. When a new refinery in Rhodesia is completed, the management expects all of N' changa's output to go into electrolytic copper. Capacity should be 124,000 long tons of copper by the years' end.

★**Union Miniere du Haut Katanga,** produced 4,403 tons of cobalt last year, as against 4,322 in 1948. Production of copper fell off, reaching 141,139 tons, against last year's 155,515 tons.

IN EUROPE

• The ECA Helps Mines

• Spanish Tungsten Up

★The ECA special mission to western Germany has agreed with the **Stolberger Zinc AG** on terms for a loan of 2,400,000 marks to develop the company's Maubach lead-zinc property. The money comes from ECA counterpart funds. Repayment is to be in lead or zinc at the company's option. The contract went to Washington for approval.

★ECA counterpart funds will also be used to put **Italy's sulphur mining industry** back on its feet. Most of these funds will go into exploration for new deposits. Total expenditure this year for technical services, including research, will be raised from one to 20,000,000 lire.

★Although deposits of about 1,000,000 tons of **uranium-bearing rock** have been found in the Dolgelly black shales in North Wales, the Government says the deposits are too low-grade to work. Containing 80 grams U_3O_8 per ton, these shales are below the minimum standard set by the Ministry of Supply. The Department of Scientific and Industrial Research, however, claims that these deposits are in no way inferior to the ore now being mined by the Russians in Eastern Europe.

★**Tinplate is so scarce** in Holland that production of canned food may be seriously curtailed this winter. A new tinplate plant is being built. One of the major causes of the shortage was the harbor strikes that forced U. S. shipments of tinplate into Hamburg and Bremen instead of Rotterdam or Amsterdam.

★**France gave Russia** 5,000 tons of sheet steel pilings during August and September as part of a private barter deal for Russian manganese. The sheet piling will be used in underwater construction.

★A French-Canadian syndicate has applied to the Norwegian Government for a water-power concession in Western Norway. The group wants to set up a zinc plant in Sunndalsoera.

★Output of **Spanish tungsten** is rising again. Production reached a peak in 1943, when both Western Allies and Germany were eagerly buying Spanish mineral. Output that year reached 4,000 tons, but fell off to 400 tons by 1947. Production was 855 tons, but it is expected to go much higher this year. Antimony metal output is also increasing.

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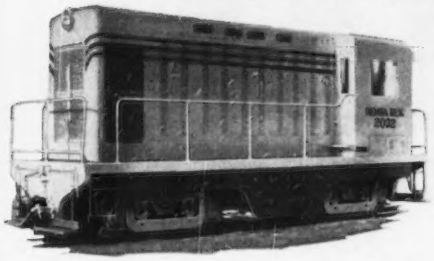

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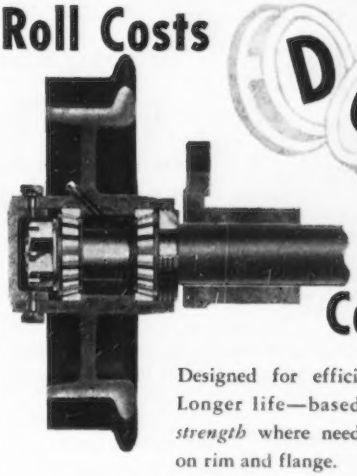

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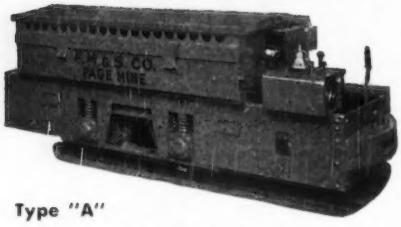

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NEW BOOKS

MAKING CAPITALISM WORK, by Dexter M. Keezer et al; McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York; 1950. Price $3.50; pp. 316.

As the title clearly implies, the authors think that capitalism, despite its numerous advantages and its identification with individual liberty and dignity, must be given several treatments if it is to have a prosperous future. Main sources of concern are the demands for individual security which grew out of the depression and the financial demands of our national security programs. The principal recommended treatments are improved labor-management relations, removal of tax deterrents to business investment, larger investments in new tools and plant modernization, limiting personal-security programs to capacity to pay, conservational use of resources, reducing the tax load and wider development of incentives. The book has a healthy viewpoint and an interesting style.

ECONOMIC MINERAL DEPOSITS. Second Edition. By Alan M. Bateman, Silliman Professor of Geology, Yale University. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Pp. 916. Price, $7.50.

This second edition of Dr. Bateman's well-known text is divided into three sections: Part I which includes principles and processes; Part II covering metallic mineral deposits; and Part III on non-metallic mineral deposits.

Changes in the second edition include reorganization and consolidation of all hydrothermal processes of mineral formation; reorganization of sections on cavity filling, replacement, sedimentation, and weathering processes; postwar information on uranium; and expansion of the bibliography.

Features of the second edition are as follows: comprehensive consideration of oxidation and enrichment of minerals; interpretation of outcrops and gossans of mineral deposits; special sections on gem stones and ground water; simple terminology; and practicality and usefulness.

ANTIMON UND SEINE VERHUTTUNG. By Walter Wendt. Published by Franz Deuticke, Vienna, Austria, Pp. 104.

The author, now living in Eferding bei Linz/Donau, Austria, has spent 12 years of his career on the metallurgy of antimony, and seven of them were as superintendent of the antimony smelter at Vajaskova, Slovakia, one of the important plants in Europe.

The book, which contains 30 photographs, drawings and sketches, covers

the field quite well. Older processes are dealt with historically. Greatest emphasis is placed on modern metallurgy including detailed descriptions of the plants in Slovakia, Servia, and Germany. The coverage is worldwide, and the bibliography quite complete, though Chinese practice is not as well described as other practices.

Blast furnace smelting is particularly emphasized and its evolution well reviewed. Other smelting methods are also well covered. Those processes best adapted to the smelting of ores up to 30% Sb in content, 35 and 50% or over, sulphide ore and oxidized ore are cataloged. The impact of flotation as a means of up-grading antimony ores, particularly stibnite, is emphasized. This latter process as a means of putting arsenic minerals into the tailings has simplified antimony smelting so that the de-arsenification of ores or metal is now much easier. Antimony ores often carry precious metals, usually gold, and this phase of extractive metallurgy is satisfactorily discussed. Refining of the metal and starring of the final product to meet the mistaken demand for cakes of metal with characteristic stars on their upper surfaces are all covered in this text. De-leading of antimony as presented here will be of interest to processors of antimonial scrap lead.

It would be a distinct service for someone to translate this book into English for use by those not proficient in reading the original German.

OLIVER C. RALSTON
Chief Metallurgist
U. S. Bureau of Mines.

MORGENTHAU, THE NEW DEAL AND SILVER. By Allan Seymour Everest. King's Crown Press, Columbia University, New York. Pp. 209. Price, $3.50.

A comprehensive story of silver legislation and the maneuvers of the Congressional silver bloc and the U. S. Treasury during and since Morgenthau's time in office. The analysis is written with obvious bias against the silver bloc. Chief value of the book is its portrayal of Morgenthau's views and actions, as the author had access to Morgenthau's private papers.

Books Received

The A-B-C's of Aluminum from Raw Material to Application. A profusely illustrated booklet covering the mining, production, fabrication and uses of aluminum. Pp. 96. Available free upon written application to Reynolds Metals Co., 2500 So. Third St., Louisville, Ky.

Fifty-Eighth Annual Report of the Ontario Department of Mines, Vol. LVIII, Part I, 1949. This report consists of a statistical review of the mineral industry of Ontario; mining accidents in Ontario in 1948; and classes for prospectors, 1948-49. Published by the Department of Mines of

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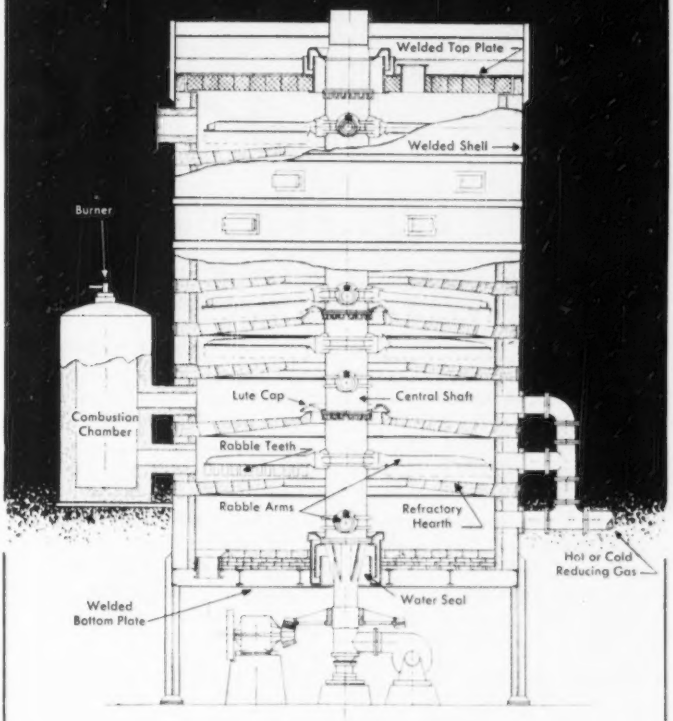

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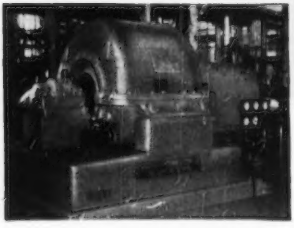

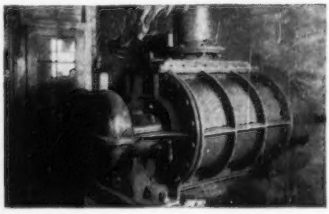

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Mining Year Book. Compiled by Walter E. Skinner. Complete information concerning 950 major mining companies in Africa, Asia, Australia, North and South America, and Europe are included in this international standard reference work. Reports on companies include address of home office, officers of the company, branch offices, key engineering and executive personnel, capital, dividends, production, and financial status of the company. Published by Walter E. Skinner, 20 Coptill Ave., London E. C. 2. Pp. 810. Price, $7 postfree abroad.

Regulations Under the Mines Act. Information pertaining to the disposal of mining claims and placer claims in Manitoba as revised and consolidated up to April, 1950. Published by the Department of Mines and Natural Resources of Manitoba, Winnipeg, Manitoba. Pp. 78.

Sillimanite Deposits of the Dillon Region, Montana. By E. Wm. Heinrich. Memoir No. 30 published by the State of Montana, Bureau of Mines and Geology, Butte, Montana. Photomicrographs of mineral specimens are excellent in this memoir consisting of a comprehensive discussion of sillimanite deposits of the Dillon region. Pp. 43 plus four plates and 7 maps.

Directory of Montana Mining Properties, 1949. By Millard L. Reyner and Carl Trauerman. Memoir No. 31 published by the State of Montana, Bureau of Mines and Geology, Butte, Montana. This is one of the best state mining directories published. It includes simplified county maps showing locations of all mining properties listed in the directory. The maps include only essential information such as main and unimproved highways, railroads, power lines, rivers and creeks, and power plants. Typical items covered in property descriptions include: owners, history, claims held, development, equipment, production and general remarks about ownership and operations. The directory concludes with an index to mining districts, mining properties, and officers, owners, and operators mentioned in the directory, also a mineral map of Montana. Pp. 125.

Liquid Metals Handbook. Published by the Joint AEC-Navy Committee. Liquid metals may be used as coolants in nuclear chain reactors producing power. This text is of primary interest to reactor designers. However the handbook is expected to encourage the use of liquid metals in other industrial applications. Metals discussed in the handbook include: aluminum, antimony, bismuth, cadmium, cesium, gallium, indium, lead, lithium, magnesium, mercury, potassium, rubidium, sodium, thallium, tin, zinc and several others. The Liquid Metals Handbook may be obtained from the

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CYANIDATION and CONCENTRATION of GOLD and SILVER ORES

By JOHN V. N. DORR, *President*, and F. L. BOSQUI, *Chief Metallurgical Engineer*, both of the Dorr Company, New York.

909 pages, 6×9, 101 illus., $8.50

BEGINNING with a brief historical survey of the field, this book takes you through every operation in the recovery of gold and silver by cyanidation and concentration. It covers the testing, examination, and sampling of ore, its sorting, and the crushing techniques used in reducing it. It tells you how ore is classified . . . how it is separated . . . and how both sand and lime are treated.

It discusses roasting, direct amalgamation, barrel amalgamation, and the precipitation of gold and silver. The factors entering into controlling the operation of a cyanide plant are explained, as are the properties and control of various cyanides. Discussed, too, are various miscellaneous processes for extracting gold and silver values.

The book describes methods for treating simple and complex ores, showing most effective practices in the principal gold- and silver-producing areas of the world. The factors affecting the cost of building, maintaining, and operating a plant, as well as power requirements for working with various ores are considered. An appendix gives helpful data on tests, methodology, measures, etc.

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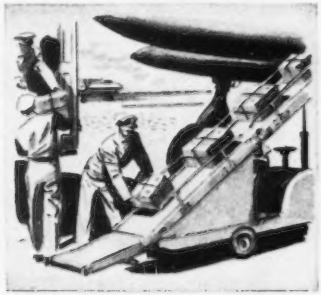

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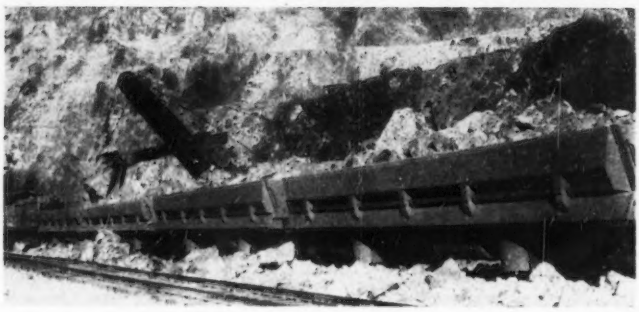

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Superintendent of Documents, U. S. Government Printing Office, Washington D. C. Price, $1.25.

1948 Minerals Yearbook. The new volume has been increased to 1,626 pages to cover domestic and foreign mineral statistics. Bound copies can be obtained from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Price, $4.25. All chapters of the volume have been printed as preprints which are also available from the Superintendent of Documents.

Geologic Description of Manganese Deposits of California. By Parker D. Trask and others. Published as Bulletin 152, Division of Mines, State of California Department of Natural Resources, Ferry Bldg., San Francisco, Calif. Pp. 378 plus a map pocket containing 20 maps. Price, $2.75. (Residents of California please add 3% sales tax.)

A Survey of Weathering Processes and Products. Revised Edition by Parry Reiche. A brief review of rock weathering and soil formation for students of geology. Published by University of New Mexico Press, Albuquerque, N. M. Pp. 95. Price, $1.00.

The Geology of Eastern Connecticut. By Wilbur G. Foye, Ph.D. State of Connecticut Geological and Natural History Survey, Hartford, Conn. Bulletin No. 74. Pp. 100.

Speaking Can Be Easy . . . for Engineers Too. An illustrated manual written for engineers by the Engineers' Council for Professional Development, 39 W. 39th St., New York, N. Y. Pp. 24. Prince, 50c.

Pocket Encyclopedia of Atomic Energy. By Frank Gaynor. Contains over 2,000 entries with numerous charts, tables, and illustrations pertaining to the atomic nucleus and nuclear energy. Published by the Philosophical Library, 15 E. 40th St., New York 16, N. Y. Pp. 204. Price, $7.50.

Geology and Mineral Deposits of the Cartersville District, Georgia. U. S. Geological Survey Professional Paper 224. By Thomas L. Kesler. Text covers the famous Cartersville district known principally for its numerous barite, manganese, brown iron, ocher, and specular hematite deposits and mines. For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Pp. 97 plus map pocket containing 6 maps. Price, $1.75 (paper cover).

Mica Deposits in Minas Gerais Brazil. Geological Survey Bulletin No. 964-C. For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Pp. 305 plus map pocket containing 4 items. Price 60c. (paper cover).

Canadian Trade Index, 1950 Edition. Contains alphabetical mailing list of approximately 10,000 manufacturing firms with addresses, branches, cable addresses, etc., and a classified list of thousands of industrial products with names of firms manufacturing them. Published by Canadian Manufacturers Association, 67 Yonge St., Toronto 1, Ontario. Pp. 1086. Price, $7.50.

Nickel and Its Alloys. The booklet stresses physical and mechanical properties of nickel and its ferrous and non-ferrous applications. It also covers sources, extraction, recovery, refining, metallography and fabrication. Published by the National Bureau of Standards, U. S. Department of Commerce, Washington 25, D. C. Circular 485. Pp. 72. Price, 50c.

A Glossary of Uranium and Thorium-Bearing Minerals. By Judith Frondel and Michael Fleischer. Geological Survey Circular No. 74. Free, upon application to the Director of the U. S. Geological Survey, Washington 25, D. C. Pp. 20.

Annual Review Number of The Mining Journal. A survey and review of world mining industry by product and by country. Published by The Mining Journal, Ltd., 15, George Street, Mansion House, London, E. C. 4. Pp. 208. Price, 5s.

The Organization of Sedimentary Rocks. By E. C. Dapples, W. C. Krumbein, and L. L. Sloss. A proposed classification for rapid determination of sedimentary rocks using the binocular microscope. Reprinted by the Department of Geology, Northwestern University, Evanston, Ill., from Sedimentary Petrology, April, 1950. Pp. 20.

Physical Characteristics of Commercial Sheet Muscovite in Southeastern United States. Geological Survey Professional Paper 225. By R. H. Jahns and F. W. Lancaster. For sale by Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Pp. 109. Price, $1.25.

The Interservice Training Course in Air Pollution. A series of lectures presented at the University of Michigan, School of Public Health, Ann Arbor, Mich., on the nature and sources of air pollution and remedial measures. Pp. 145.

Lehubuch der Bergbaukunde. Two Volumes. By Dr.-Ing. C. Hellmut Fritzsche, Professor der Bergbaukunde und Bergwirtschaftslehre an der Technischen Hoschule, Aachen. Published in German. The english equivalent of the title of the books would be "Elements of Mining," for the work represents a comprehensive review of mining practices and equipment used in Germany, particularly coal mining. The first volume covers general geology; drilling; blasting;

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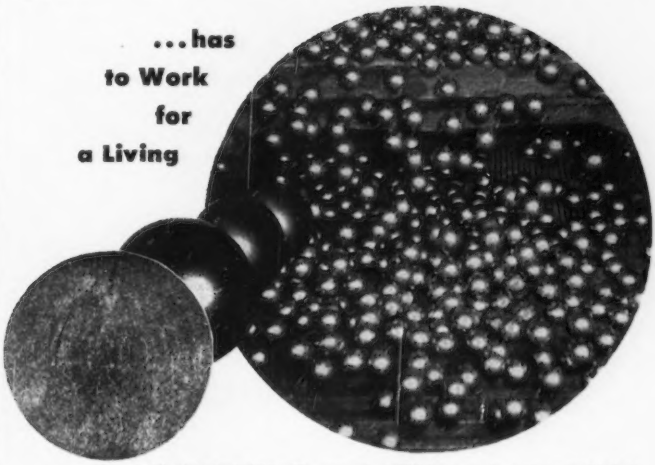

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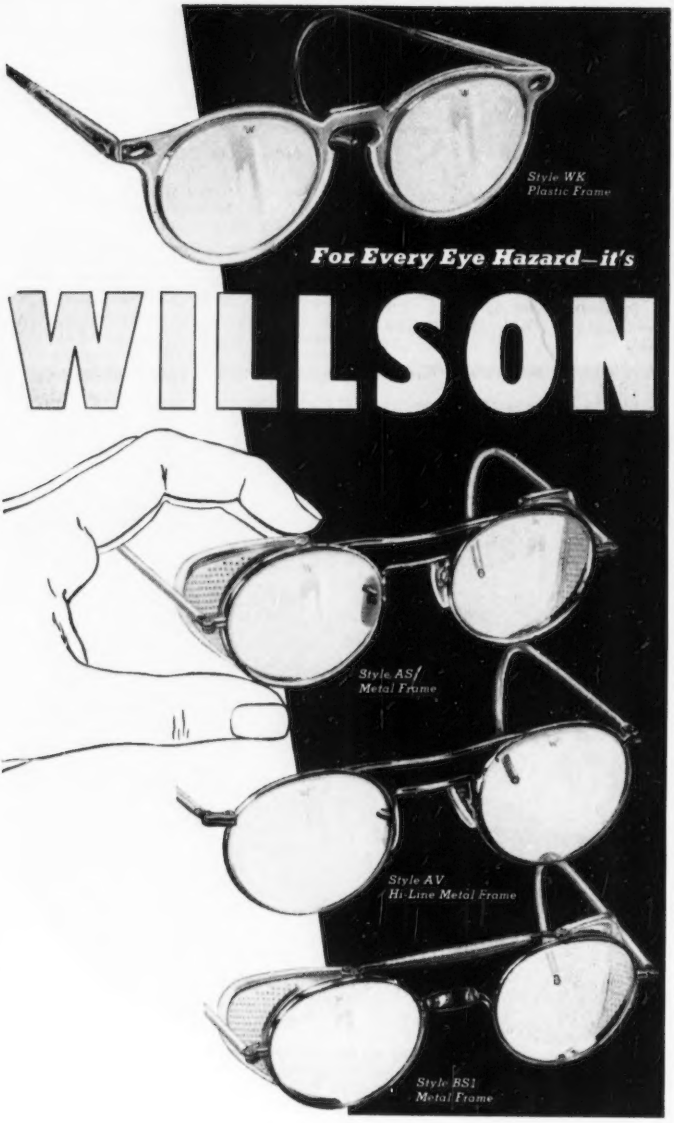

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development and exploitation of orebodies and coal seams; gas and atmospheric conditions underground; and ventilation problems and layouts. The second volume has chapters on tunnel, drift, and chamber supports; stope timbering; shaft sinking and shaft supports; transportation; underground conveyors and shakers; hoisting; pumping; and fire prevention, with short chapter on rescue equipment. Published by Springer-Verlag OHG, Berlin - Göttingen - Heidelberg, Germany. Vol. 1, pp. 687, plus 615 illustrations, and one colored chart. Price, 34.50DM. Vol. 2, pp. 710 and 742 illustrations. Price, 34.50DM.

Bergbaumechanik. By Dipl.-Ing. J. Maercks, Bergschule, Bochum. Published in German. This interesting volume is a valuable textbook for mining schools and handbook for the practicing mining engineer. The text deals with the theoretical and practical problems encountered in underground mining. Chapters deal with hand and mechanized loading underground; mechanical coal planner; diverse types of wood and steel supports for tunnels, drifts, and crosscuts; rock pressure problems; hoisting, pumping, ventilation; and others. Published by Springer-Verlag OHG, Berlin - Göttingen - Heidelberg, Germany. Pp. 636, plus 541 illustrations and tables. Price, 36DM.

Bergschadenunde. By Dr. phil., Dr. Ing. eh. Oskar Niemczyk, Professor für Markscheidewesen und Bergschadenkunde an der Rheinisch-Westfälischen Technischen Hochschule, Aachen, Germany. Published in German. First volume ever to be published covering the subject of damage done to surface structures by ground movement, subsidence, etc. Contents of the book disclose the author's thorough knowledge of the subject discussed, and one that is receiving increased attention by the mining industry in general everywhere. Rock pressures, earth movements, subsidence and their effect underground and surface are comprehensively explained and illustrated, and of more than ordinary interest is the chapter dealing with the matter of investigation and calculation of damages caused on the surface by these phenomena. Published by Verlag Glückauf G.m. bH., Essen, Germany. Pp. 291 plus numerous graphs, tables and illustrations. Price, 36DM.

Business . . . Big and Small . . . Built America. Statements by officials of United States Steel Corp. before the Subcommittee on the Study of Monopoly Power of the House Committee on the Judiciary. An excellent summary of the contribution of the steel industry to progress of the economy, complete with numerous statistical charts and tables, and discussions of such vital topics as sources of iron ore, modern research, competition in steel, facts about the concentration of the steel industry,

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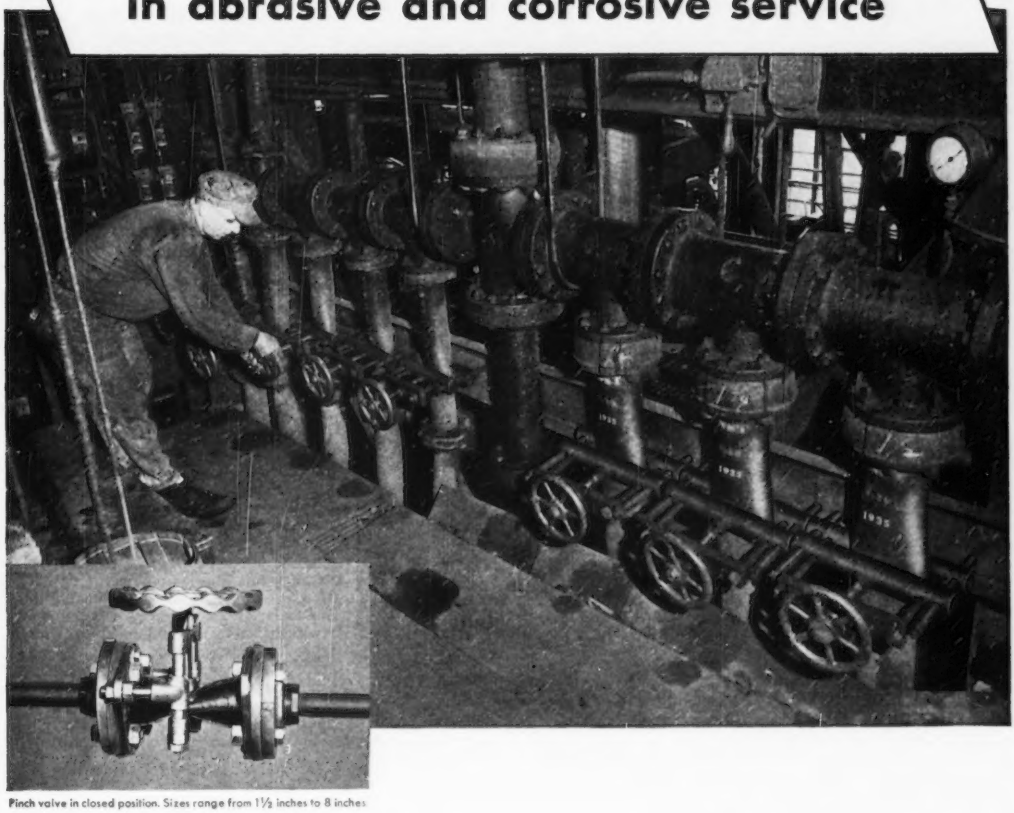

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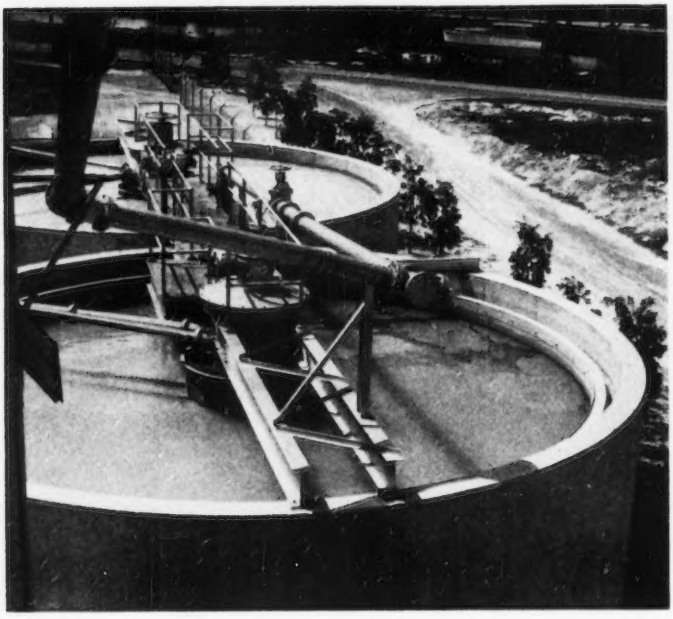

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and who owns U. S. Steel. Copies available upon request of J. Carlisle MacDonald, Assistant to Chairman, United States Steel Corp., 71 Broadway, New York 6. N. Y. Pp. 172.

Bureau of Mines Publications

The following publications may be obtained from the Bureau of Mines Publication Distribution Section, 4800 Forbes St., Pittsburgh, Pa.

I. C. 7573. Achievements in Mine Safety Research and Problems Yet to Be Solved. By Arno C. Fieldner. Among the problems yet to be solved as discussed in this circular are: Safe handling and use of explosives; dust explosions; gas explosions; ventilation, mine air, and air-borne dust; oxygen breathing apparatus, respirators, and gas masks; electrical and mechanical equipment; and prevention of roof falls. Pp. 31.

I. C. 7574. Review of Literature on Health Hazards of Beryllium and Its Compounds. By G. G. Morgis and P. J. Forbes. The manufacture of fluorescent lamps in which beryllium phosphors were used resulted in a new and serious occupational disease called beryllosis. Fortunately this report makes this statement: "Injuries caused by beryllium compounds have *not* been reported as occurring in the mining, handling, and shipping of beryl. Cases first appeared in the industrial processes of crushing or extracting the beryllium compounds from the ore." Another interesting statement made in this report—"Cadmium is one of the substitutes for beryllium now being used as a phosphor in fluorescent lamps." Pp. 23, including a complete bibliography.

R. I. 4710. Rate of Evaporation of Zinc at Low Pressures. By H. W. St. Clair and M. J. Spendlove. Pp. 13 plus 13 illustrations.

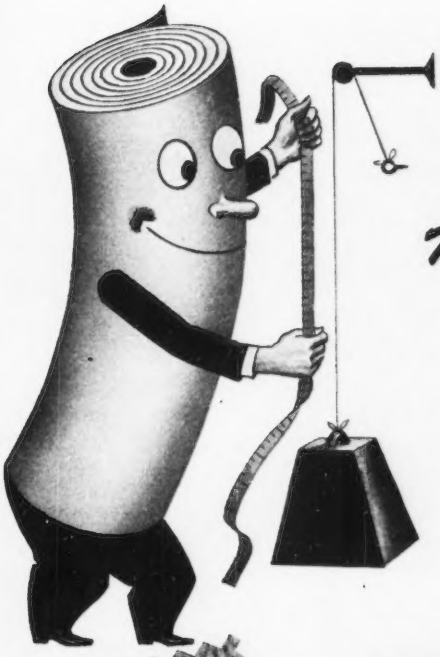
R. I. 4711. Improvements in Methods for Preparing Thin Sections of Rock. By Harold L. Gibbs and LaMar G. Evans. Pp. 6 plus two illustrations.

R. I. 4704. Investigation of the Coosa Tin Deposits, Coosa County, Ala. By Avery H. Reed, Jr. Pp. 33 plus 17 maps and illustrations.

R. I. 4706. Investigation of the Lake Shore Copper Deposits, Pinal County, Ariz. By T. M. Romslo. Pp. 24 plus 7 maps and illustrations.

R. I. 4709. Development of a Mobile Compressor and Utility Station. By Fred D. Wright and Homer J. Ballinger. Essential construction details of the mobile compressor unit used at the Rifle oil-shale operations are described and illustrated. Pp. 4 plus 3 illustrations.

R.I. 4672. A process for the Recovery of Gold from Activated Carbon by Leaching and Electrolysis. By J. B. Zadra. Pp. 74 including numerous tables and illustrations.



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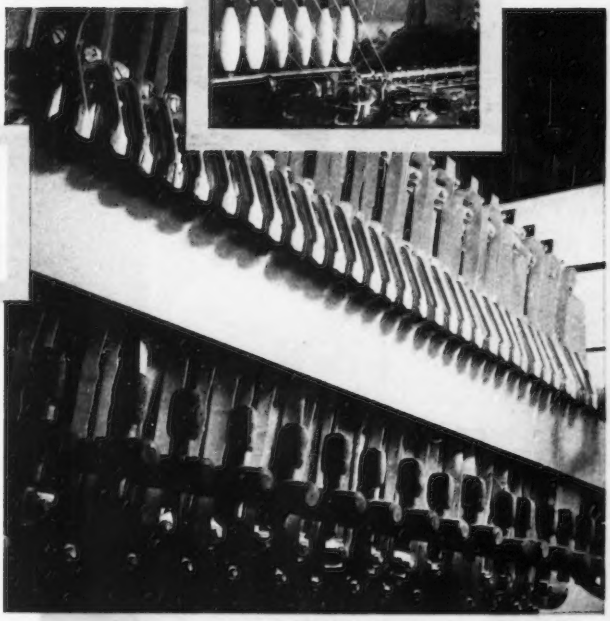

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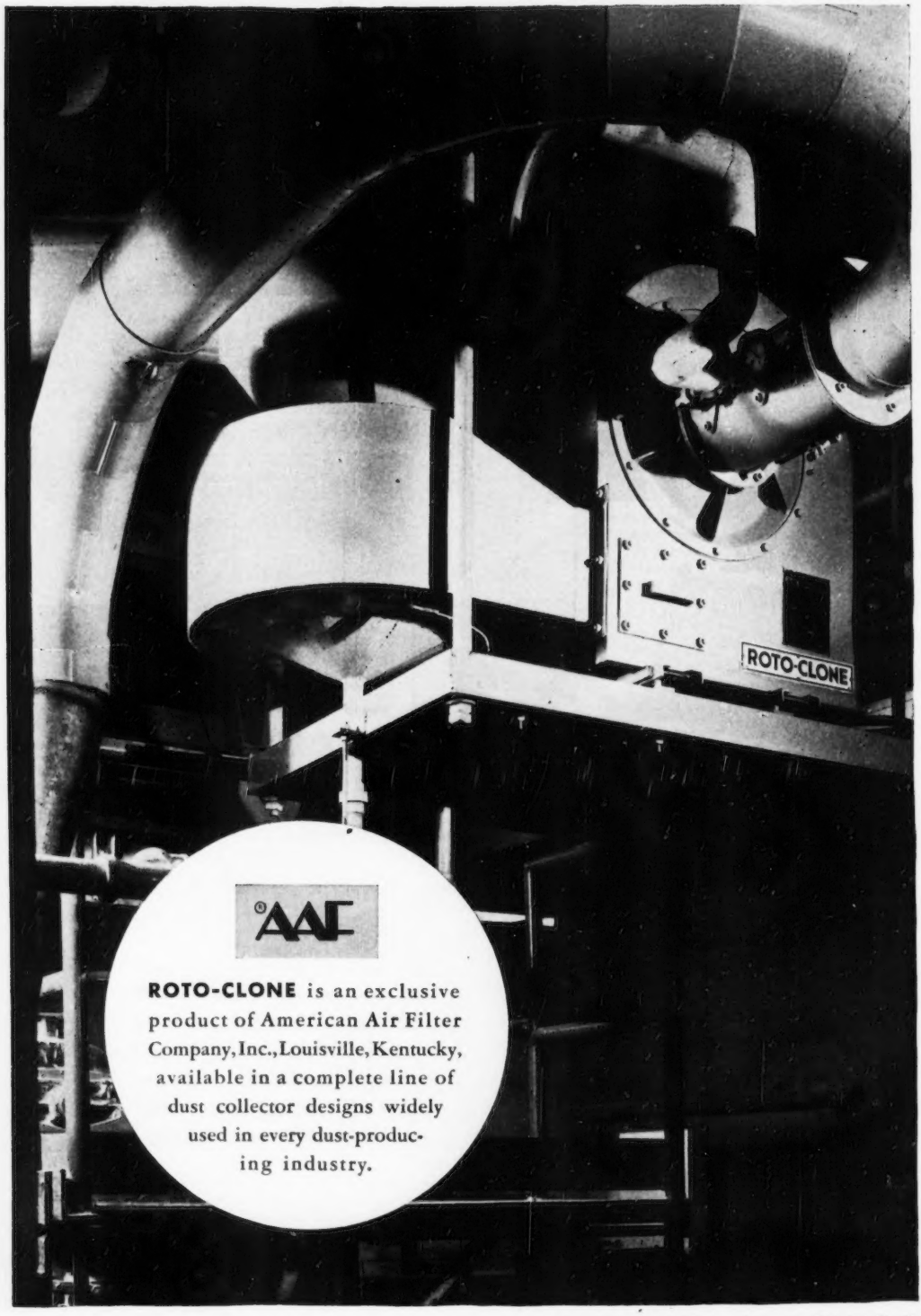
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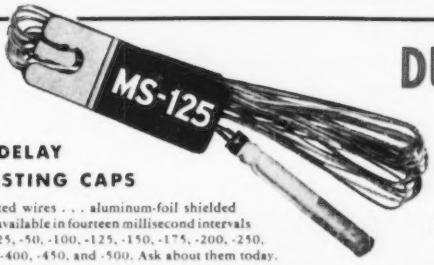

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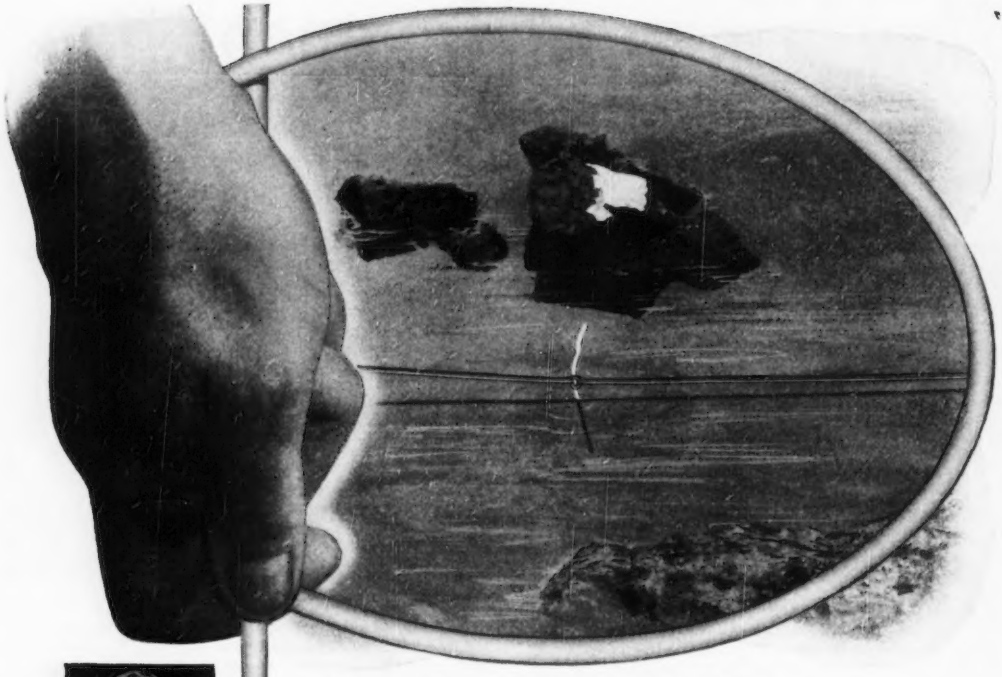

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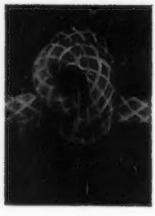

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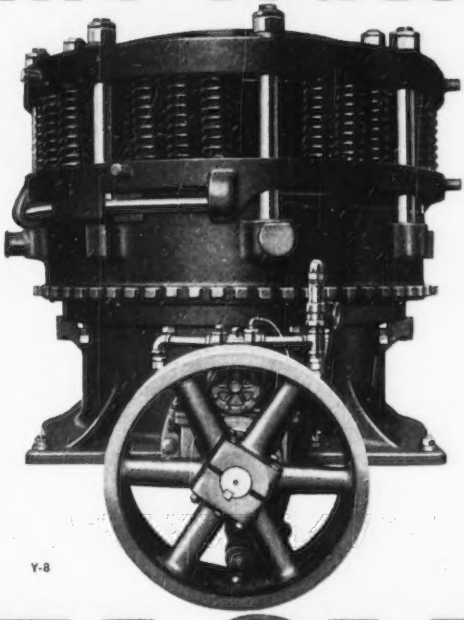

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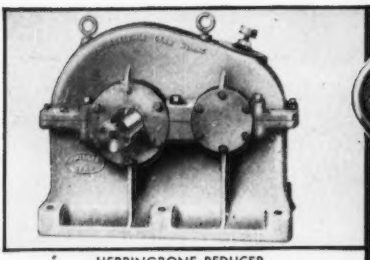
8495

HAZARD insulated wires and cables for every mining use

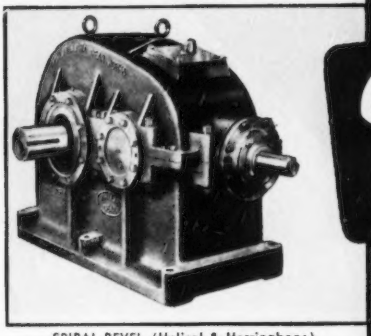
PHILLIE GEAR

SPEED REDUCERS

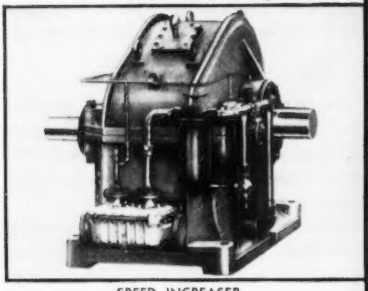
One Name ALL TYPES



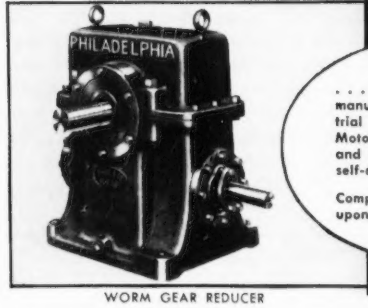
HERRINGBONE REDUCER



SPIRAL BEVEL (Helical & Herringbone)



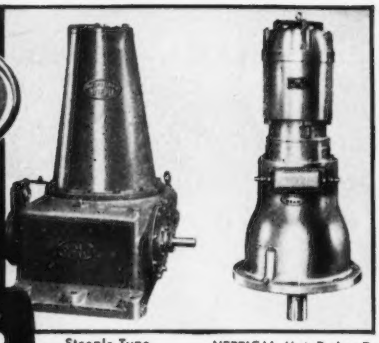
SPEED INCREASER



WORM GEAR REDUCER

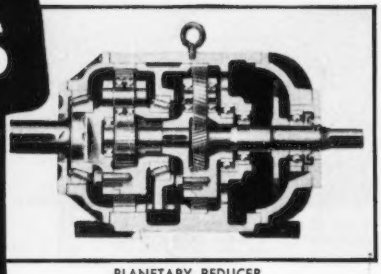
. . . produced by a Pioneer in the design and manufacture of Gear Driven Reducers for industrial use. Also the well-known, self-contained MotoReduceR (in horizontal or vertical drives)—and the Philadelphia GearMotoR (a horizontal, self-contained reducer) for drives up to 60 H.P.

Complete catalogs on any type of Reducer, sent upon request on your Business Letterhead.

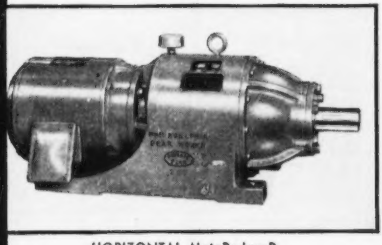


Steeple Type WORM REDUCER

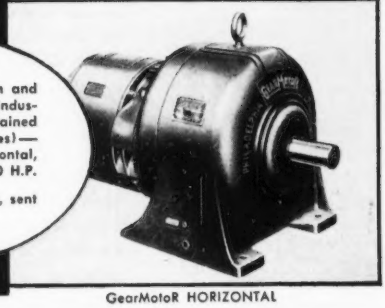
VERTICAL MotoReduceR (With Planetorque)



PLANETARY REDUCER



HORIZONTAL MotoReduceR



GearMotoR HORIZONTAL

Philadelphia Gear Works, INC.

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Industrial Gears and Speed Reducers
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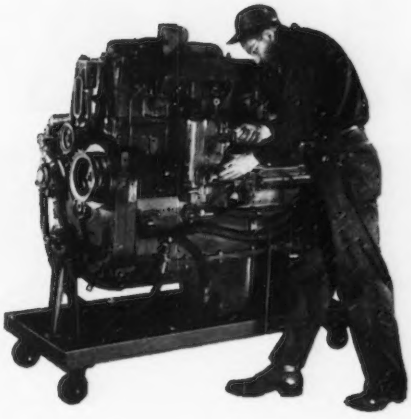
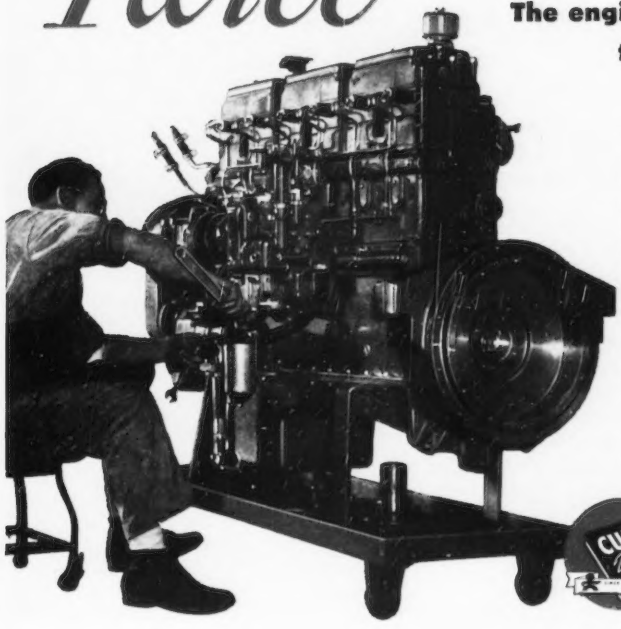
Cummins® Custom-built Diesels

Built . not once but Twice



The engine that's built better to give power at lower cost



Why is a lightweight, high-speed Cummins Diesel the best buy in economical, dependable power? *Because every* part of *every* engine is made under strictest quality control methods. Each engine also is actually built *twice*. After initial assembly, each engine is run-in on the test block. Then it is torn down and carefully re-inspected—after that it is re-assembled and tested *again*.

Perfection in engine craftsmanship . . . Cummins exclusive fuel system . . . an unexcelled service and parts organization . . . mean that rugged, dependable Cummins Diesels make more profits for power users.

There's a model for your power needs. Contact your Cummins dealer. He has more facts to show you about making more profits with

CUMMINS Dependable DIESEL

TRADEMARK REG. U.S. PAT. OFF.

Diesel power by CUMMINS

CUMMINS ENGINE COMPANY, INC. · COLUMBUS, IND.

EXPORT: CUMMINS DIESEL EXPORT CORPORATION
Columbus, Indiana, U. S. A. · Cable: Cumdiex

Lightweight High-speed Diesel Engines (50-550 hp) for: On-highway trucks · off-highway trucks · buses · tractors · earth-movers · shovels · cranes · industrial locomotives · air compressors logging yarders and loaders · drilling rigs · centrifugal pumps generator sets and power units · work boats and pleasure craft.

Designed for Greater Range and Capacity

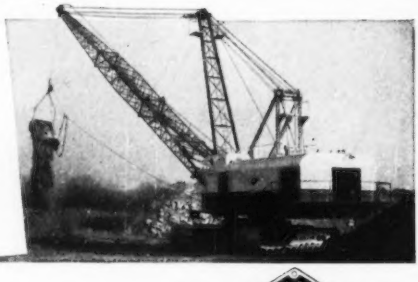
LIMA 2400

This big machine is engineered and constructed for extra-heavy duty. It has met with enthusiastic acceptance, and is setting new performance records on coal stripping and mining operations.

Features include: "precision" air control of all operating functions; anti-friction bearings at all vital bearing points including drums, cone rollers and hook rollers; Large, grooved drums – tapered for shovel operations; truck base and rotating base of heavy one-piece annealed cast steel; extra sturdy construction; easy accessibility of all parts requiring lubrication or maintenance; Hamilton Diesel power plant–plus many other features for maximum performance and availability.

The LIMA line includes Shovels ¾ to 6 yards, Cranes to 110 tons, and Draglines, variable. Offices in principal cities of the world.

LIMA Rubber Mounted Cranes are Available in 20 and 35 Tons Capacity



Lima Shovel and Crane Division

LIMA, OHIO

OTHER DIVISIONS: *Lima Locomotive Works Division; Niles Tool Works Co.; Hooven, Owens, Rentschler Co.*

LIMA HAMILTON CORPORATION

$10,000 SAVED ANNUALLY

ON A $12,600 INVESTMENT

$3,500 SAVED ANNUALLY

ON A $4,200 INVESTMENT

These are actual Case Histories

CASE HISTORY No. 1

With a New Bulldog Hammermill crushing 20" and under Fuller's Earth, 50% Moisture

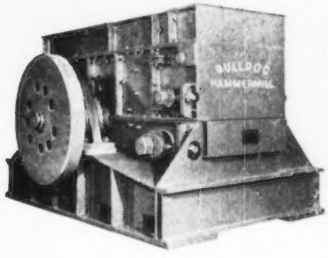
Before	After
Operation required one primary double roll, 8 screens, two secondary double rolls, with auxiliary equipment. Continuous clogging, produced irregular finished product, consumed excessive fuel in drying, extruding operations expensive.	Installing one Bulldog Hammermill. One stage operation, no clogging—no delays or shut-downs. Now produces a uniform cubicle product easily dried, saving fuel. Saves labor, maintenance, fuel and produces a better finished product.

CASE HISTORY No. 2

Rebuilding an existing operating Hammermill Crushing Limestone for cement

Before	After
Maintenance required replacement of 26,400 lbs. of manganese steel hammers and 12 sets of hammer bolts annually. Load capacity required extra operating hours. Primary grinding was not suitable for final roll type pulverizer.	With Bulldog rebuilding, the Hammer replacement was reduced to 3,600 lbs. manganese steel and one set of hammer bolts per year. Capacity increased 30% with less power consumption, better finished product saving power and maintenance in roll type pulverizer.

CAN YOU CUT COSTS - INCREASE CAPACITY - IMPROVE PRODUCT



with a

New Bulldog Hammermill

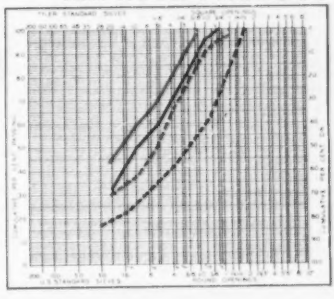
Compare your crushing operation with the actual proven results charted at right.

SOLID RED LINE indicates material from Bulldog Hammermill with screens in closed circuit.

DOTTED RED LINE shows Bulldog Hammermill no screens, open crushing.

SOLID BLACK LINE indicates standard impactor with screens in closed circuit.

DOTTED BLACK LINE indicates standard hammermill no screens, open crushing.



Bulldog Hammermills with Non Clog *Moving Breaker Plate* for sticky or high moisture materials or with *Stationary Breaker Plate* for dry materials are built in all sizes up to 72" x 60" for primary, secondary, and fine reduction. Write for complete details.

A PRODUCT OF PETTIBONE MULLIKEN CORPORATION

Hammermills, Inc. is now a division of Pettibone Mulliken Corp., and has the tremendous facilities of PMCO. to back our products . . . with full control over research, construction and fabrication combined under one roof.

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How leading operators use

BECKMAN pH CONTROL

To boost recoveries, save man-hours, reduce processing costs per ton of ore

Throughout the mining industry—in gold, tin, tungsten, lead, zinc, copper and many other flotation operations—Beckman pH Control is proving to be the key to much higher recoveries, better control of processes, lower labor and chemical costs. *Result—substantially greater profits per ton of ore!*

THE BECKMAN MODEL H-2 pH METER

is one of a complete range of Beckman pH Meters available for every type of application*. The H-2 is particularly recommended for applications where high accuracy and simple operation—combined with the convenience and low cost of 115-v. AC operation—are desired.

It provides instant and direct pH readings, and a simple, built-in dial permits quick, convenient temperature compensation over the entire range of 0° to 100°C (32° to 212° F.). High reading accuracy is assured by wide-spread dual range scale that reads from 0 to 8 pH or from 6 to 14 pH at the turn of a switch. Same switch also provides instant millivolt readings from 0 to ±800 mv and from ±600 to ±1400 mv for titrations and oxidation-reduction measurements.

Built-in electrode support and compact case design save valuable space and permit easy portability to various plant locations.

Particularly important is the wide range of factory-sealed, maintenance-free Beckman Glass Electrodes available for use with this instrument . . . electrodes that are virtually unbreakable . . . that cover extreme temperature ranges from below freezing to above boiling . . . that have an unprecedented pH range with negligible errors . . . that are abrasion-resistant and chemically durable to a degree never before thought possible in glass electrodes.

*In addition to the H-2 Meter, other Beckman pH equipment includes completely automatic pH indication and control instruments for large-scale process applications . . . battery-operated models for complete portability in plant and field use . . . and a laboratory type instrument that features maximum versatility and accuracy for research and laboratory applications.

HERE ARE TYPICAL EXAMPLES:

A large Canadian mill found that by Beckman-controlling the alkalinity of the copper and zinc circuits (each at a different pH), far greater recoveries were obtained—at lower chemical costs—with better control of froth and steadier operation of circuits. This mill now uses completely automatic Beckman pH Control wherever possible.

A large Bolivian tin producer found that Beckman pH control of its complex flotation processes not only increased recovery but also simplified control of its operations and assured greater uniformity, less waste, faster treating time.

Another operator handling zinc, copper and other ores in multiple circuits found Beckman pH Control to be "one of the greatest improvements" made in his mill operations. Ore changes, even from a single mine, caused wide pH fluctuations. With Beckman equipment "such changes are now detected and corrected immediately—not sometime after the analyses are in." The resulting greater recovery and higher profits per-ton paid off the installation in a few months and continue bringing in added profits year after year.

Don't overlook the advantages of Automatic pH Control! The Beckman Model H-2 Meter above is ideal for spot checks and portable applications. For added savings be sure to investigate Beckman *completely automatic* pH recording and control. Electrodes placed in various circuits operate centralized control equipment to permit instant check on each processing step, provide a written record for subsequent analysis, and make possible many other cost-cutting advantages.

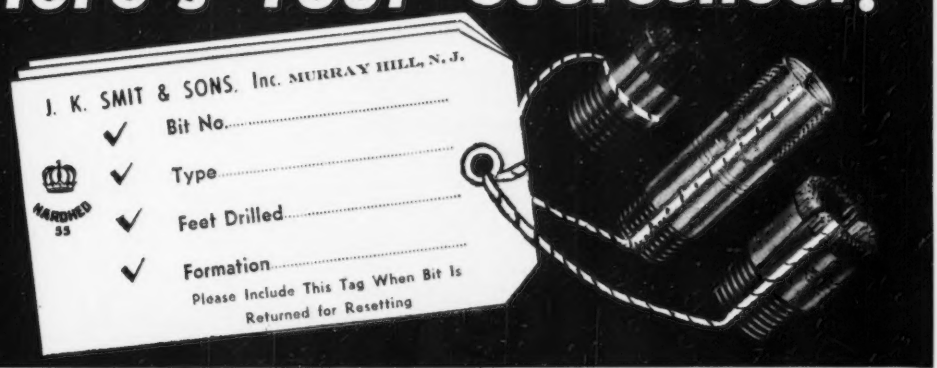
Your authorized Beckman dealer will gladly supply more data on the profitable application of Beckman pH Equipment—or write direct. *Beckman Instruments, National Technical Laboratories, South Pasadena 27, California.* Factory Service Branches: NEW YORK • CHICAGO • LOS ANGELES.

Helpful Literature gladly sent on request!

BECKMAN INSTRUMENTS
control modern industries

Beckman Instruments: pH Meters and Electrodes — Spectrophotometers — Radioactivity Meters — Special Instruments

Here's Your Scoresheet!


J. K. SMIT & SONS, Inc. MURRAY HILL, N. J.
Bit No.
Type
Feet Drilled
Formation
Please Include This Tag When Bit Is Returned for Resetting
HARDHED 55

J. K. SMIT HARDHED AND HARDHED "55" DIAMOND BITS AND REAMING SHELLS

Hardhed—Tungsten Alloy Matrix

Composed of a tungsten alloy matrix—recommended for drilling all types of ground, except extremely broken or abrasive formations. Designed for resetting.

Hardhed "55"—Tungsten Carbide Matrix

Composed of a special tungesten carbide matrix. Recommended for drilling badly broken, highly abrasive formations. Because of the protection offered the diamonds by this extremely tough matrix, the Hardhed "55" bit will stand up under the most difficult conditions, where other types of bits fail prematurely. Designed for resetting.

Hardhed "55"—Impregnated Ferret Bit

Composed of small diamond particles bonded in a special tungsten carbide matrix, and is recommended for drilling all formations, but particularly for extremely hard, fine-grained formations, such as massive quartz, quartzite, jasper and taconite where whole stone bits become dull after only a few feet of drilling. This bit is designed to be consumed without resetting.

These matrices have been developed and have proved most economical in their respective fields. They cover the complete range of all drilling conditions encountered. However, complete technical and engineering cooperation is available when desired.

A "scoresheet" is attached to every J. K. SMIT bit and reaming shell.

Score its performance in actual footage and formation data.

J. K. SMIT engineers then maintain and protect your initial investment with expert, personal attention to insure you the best possible drilling performance at greatest drilling economy.

J. K. SMIT drilling bits have a planned diamond distribution to hold gage, obtain evenly apportioned diamond wear, and to insure prolonged drilling life. The design of J. K. SMIT bits is the result of the most exhaustive tests and trials by the JKS Technical Staff. You will find the expert and higly functional design of JKS bits reflected in lowered drilling costs and high salvage returns.

In the JKS Research Laboratories both the finished bits and raw materials are studied, checked and controlled to insure continuous maintenance of the highest standards of quality. Every component must pass rigid individual tests for mechanical perfection; inside and outside diameters are carefully checked and such close tolerances maintained that bits of the same size can follow one another down the drill hole without preliminary reaming.

Write today for this FREE MANUAL and PERFORMANCE-SPECIFICATIONS

Complete data on all types of standard and custom-designed J. K. SMIT Hardhed Diamond Bits.

J. K. SMIT & SONS, INC.

Gen'l Offices & Plant: MURRAY HILL, N. J.

In Canada: 129 Adelaide St. West, Toronto, Ont.

EST. 1888

J. K. SMIT & SONS, INC.
Murray Hill, N. J. - U.S.A.

Send me your free manual on "Diamond Drill Bits"

Name..... Title .....

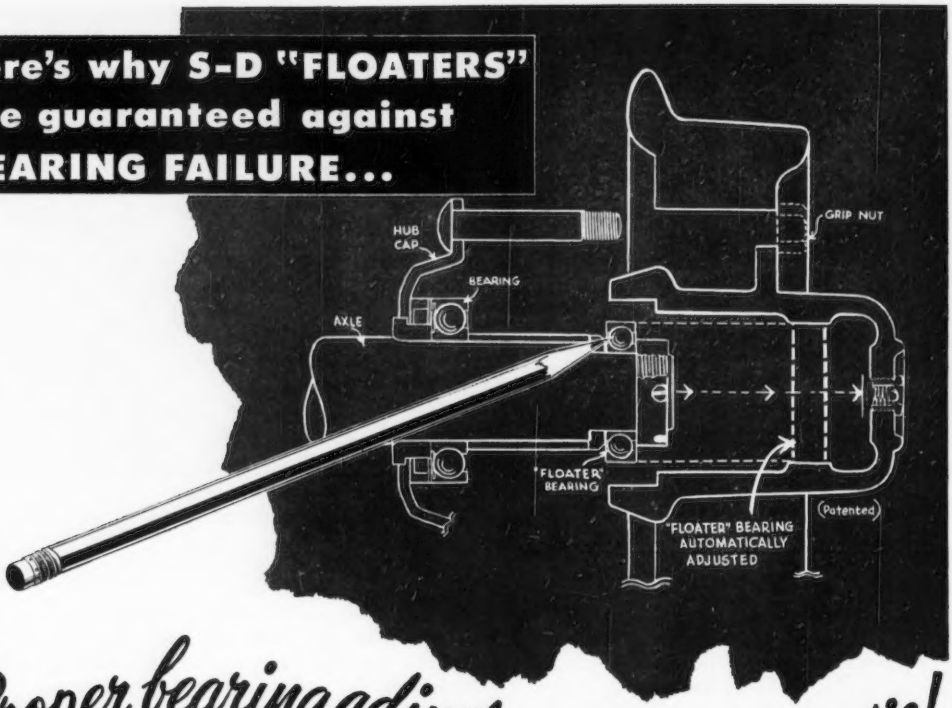
Company.....

Street.....

City..... Zone..... State.....

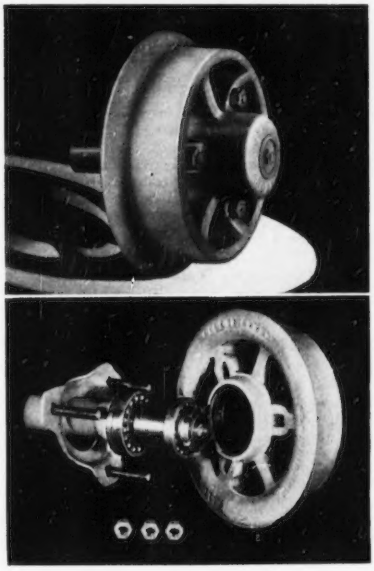
EMJ 10-50

here's why S-D "FLOATERS" are guaranteed against BEARING FAILURE...



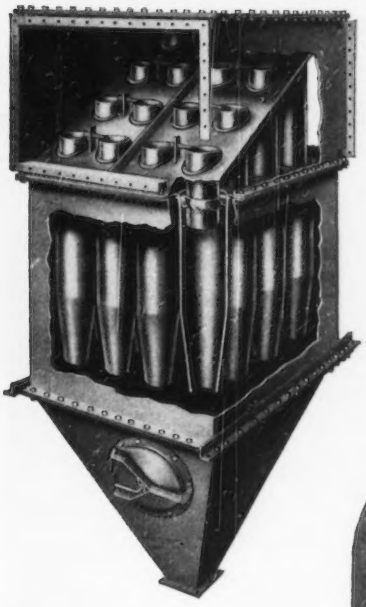
Proper bearing adjustment is automatic!

Because one of the two bearings "floats" into perfect adjustment, there are never any loose or tight bearings on S-D "Floater" Ball Bearing Wheels. That's why we can guarantee the "Floater" wheel against bearing failures for 5 years. Diagram above of a demounted "Floater" shows the heart of the wheel—that magic "floating" bearing that automatically adjusts itself when wheel is mounted and the three retaining bolts are pulled up tight. The extra large bearing absorbs all side thrusts and carries the bulk of the load. Any workman on the job can remove and replace a "Floater" Wheel because "Floater" bearings always remain in perfect adjustment on the axle whether the wheel is off or on. Remember, too, that "Floaters" have solid closed front hubs and positive back seals to keep foreign matter out and grease in! That's why so many "Floaters" often run 5 years and more on a single greasing. The S-D "Floater's" low cost of operation is certainly worth investigating. Without question, S-D "Floaters" run easier, run smoother and cost far less in maintenance than any other mine car wheel!



FOR COMPLETE INFORMATION, WRITE
SANFORD-DAY IRON WORKS, KNOXVILLE, TENN.

SANFORD - DAY IRON WORKS



No wonder "MULTICLONE" *is the leading name in the centrifugal recovery of dust and fly ash from all types of gases, hot or cold.*

No other mechanical recovery equipment has so many years of dust and fly ash recovery experience behind it . . . or has such uniformly high collecting efficiency . . . or provides so many other money-saving, space-saving advantages as MULTICLONE. The four advantages outlined below are by no means the complete MULTICLONE story, but are typical of the vital savings found *exclusively* in MULTICLONE equipment . . .

in dust and fly ash recovery

MULTICLONE COLLECTORS

***and only Multiclones* give vital advantages like these . . .**

Uniformly High Recovery:

MULTICLONE's multiple *small diameter* tubes—made possible by its exclusive vane design—whirl the dirty gases with greater centrifugal force, thus throwing out not only the large, medium and small particles, but also a high percentage of the *extremely small* particles of 10 microns and less. This, coupled with the fact that there are no pads or filters to become choked with recovered material, results in a more complete recovery of *all* suspended materials from the gas stream.

Long and narrow

Square

Maximum Adaptability:

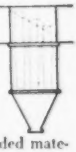
In addition to its unusual compactness, the MULTICLONE is also unusually adaptable to various installation requirements. Where head room is low it can be installed with side-inlet side-outlet connections. Where side clearances are restricted, it can be installed with side-inlet top-outlet connections. In addition, without changing capacities, the shape of the unit can be varied—long and narrow, short and wide, or square—to fit restricted spaces . . . and its single-inlet single-outlet duct requirements permit greater flexibility and simpler installation. These savings slice installation costs, space requirements and insulating expense.

Space-Saving Compactness:

Plant space costs money—so be sure to check space requirements carefully. As shown in the accompanying chart, the MULTICLONE requires less floor space and less cubic space than any other unit of comparable capacity and performance. Translate these savings into today's high costs for plant space and you readily see the great importance of this one MULTICLONE advantage alone!

Make	Relative Space Requirements In Sq. Ft.	In Cu. Ft.
Multiclone	1.0	1.0
Collector A	2.1	1.8
Collector B	5.9	3.2
Collector C	6.8	3.9

Minimum Maintenance:



The MULTICLONE has no high speed moving parts to repair or replace . . . no pads or filters to clean or renew . . . nothing to choke the gas flow or increase draft losses as suspended materials are recovered. MULTICLONE draft losses remain uniformly low *at all times*. Further, the recovered material from an entire bank of tubes is collected in a *single* hopper—far easier to service and maintain than the multiple hoppers of conventional cyclone units.

FREE INFORMATIVE BOOKLET
This 32 page booklet outlines the basic principles of centrifugal dust recovery and shows the many ways MULTICLONE advantages assure higher recovery at lower overall costs. A free copy of this booklet will gladly be sent on request. Write today!

Before you decide on any recovery equipment be sure to get complete information on MULTICLONE advantages. A letter, wire or phone call to our nearest office places this information in your hands without obligation. Get all the facts and you will get MULTICLONE Collectors!

WESTERN Precipitation CORPORATION

ENGINEERS, DESIGNERS & MANUFACTURERS OF EQUIPMENT FOR COLLECTION OF SUSPENDED MATERIALS FROM GASES & LIQUIDS

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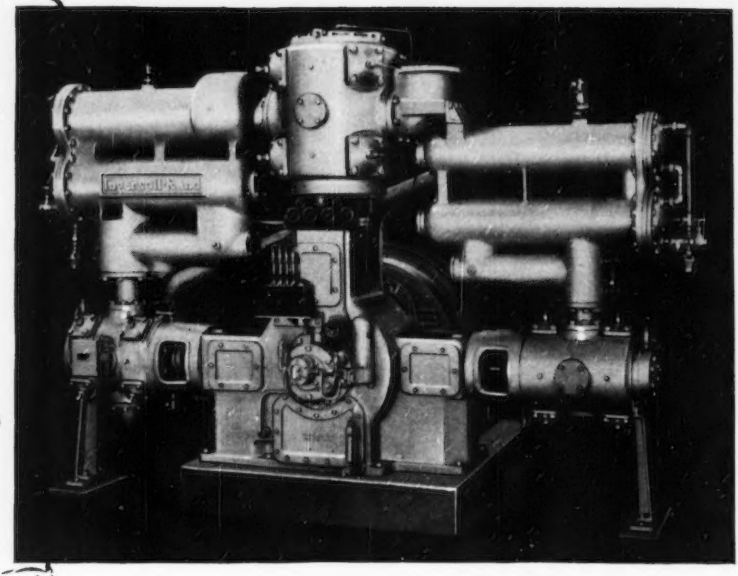
MASTER OF MANY TRADES



bearings engineered by SKF

Ingersoll-Rand's 3-stage TVH Heavy-duty Compressors are widely used for boiler soot-blowing service, for handling gases where leakage must be avoided, for compressing air in oxygen production, and in scores of other applications. They're compact, highly efficient, give long-life heavy-duty service. The two main bearings are SKF Double-Row Self-Aligning Spherical Roller Bearings. They require no adjustment . . . are engineered and built to withstand heavy radial and thrust loads. SKF specializes in supplying the bearing that's right for the job . . . the bearing that keeps friction at a minimum and makes important contributions to long-term trouble-free operation. SKF Engineers will work with you in helping you design for greater efficiency and lower operating costs. **SKF** INDUSTRIES, INC., PHILADELPHIA 32, PA., *the Pioneers of the Deep Groove Ball Bearing — Spherical Roller Bearing — Self-Aligning Ball Bearing.*

7105

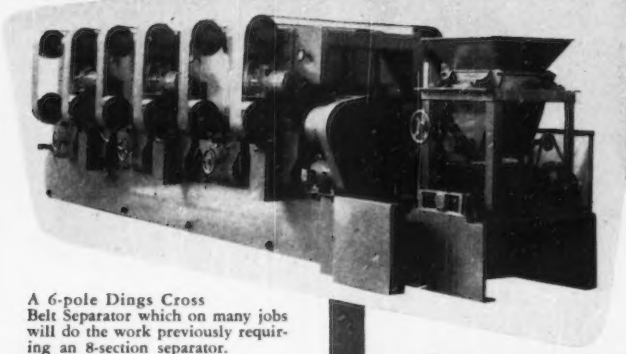
SKF

BALL AND ROLLER BEARINGS

8 REASONS WHY **SKF** IS PREFERRED BY ALL INDUSTRY

Integrity · Craftsmanship · Metallurgy · Tolerance Control · Surface Finish · Product Uniformity · Engineering Service · Field Service

THE MOST POWERFUL MAGNETIC SEPARATOR EVER BUILT FOR THE MINING INDUSTRY



A 6-pole Dings Cross Belt Separator which on many jobs will do the work previously requiring an 8-section separator.

FOR TREATMENT OF
such materials as:

Magnetite • Ilmenite
Monazite • Chromite
Garnet • Wolframite
Hubnerite • Ferberite
Pyrrhotite • Manganese, etc.

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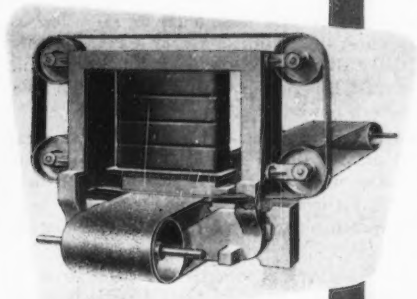

Material to be separated is carried on the main belt conveyor under a series of magnet and cross belt assemblies. Magnetic particles are attracted to the under side of the moving cross belt which sweeps them to the side to be separately discharged. Each magnet assembly can be adjusted to remove a desired magnetic fraction.

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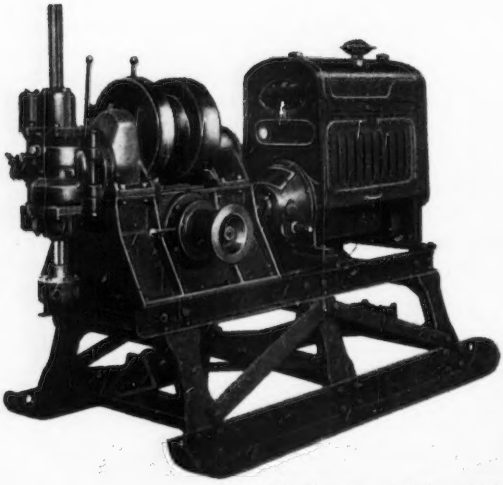

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Diamond Core Drill

For exploring for new ore bodies or extension of existing ones, the gasoline-driven CP No. 15HD DIAMOND CORE DRILL is ideal. Ruggedly built, skid mounted, it is readily moved from hole to hole under its own power.

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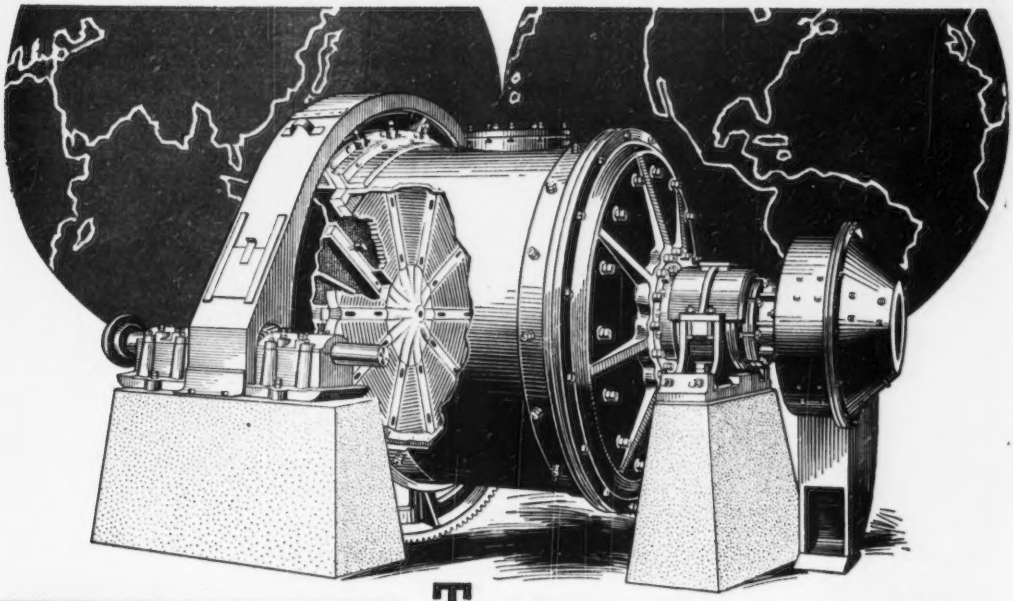

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Many of these are repeat orders

THE wide acceptance of Marcy Mills both in the United States and in the far corners of the world is based upon certain principles of design and operation.

In an open-end Marcy Mill the difference in elevation between the incoming feed and the lower point of discharge causes the fines to travel faster than the coarser particles. Thus the finished material is removed more quickly, better exposing the coarser material for further grinding.

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● Permit us to present field records which substantiate these statements.

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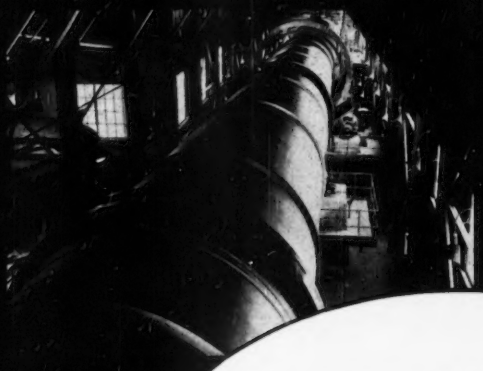

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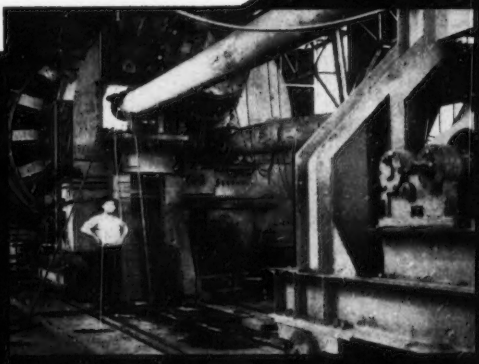

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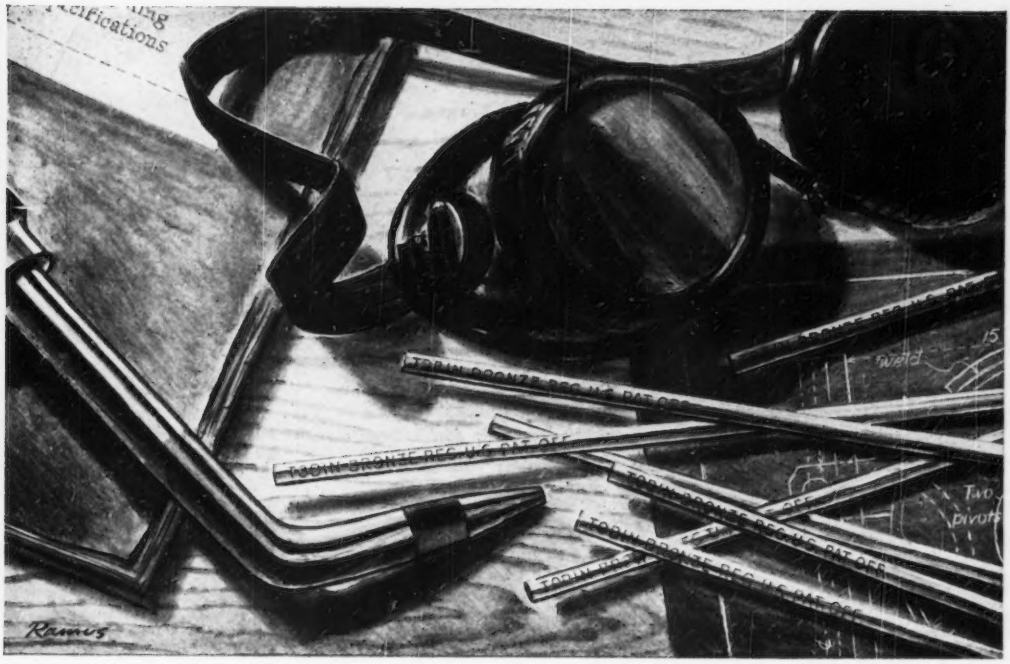
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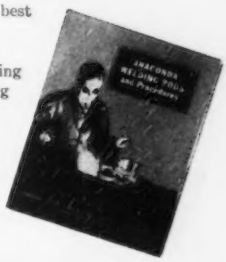

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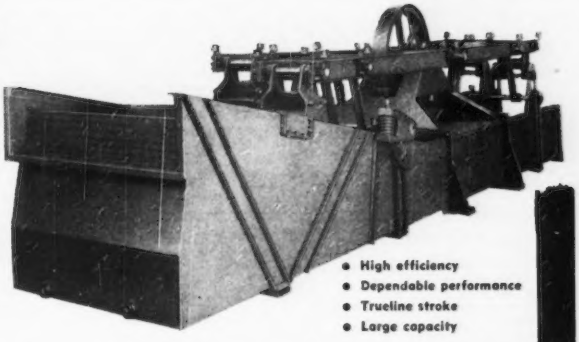

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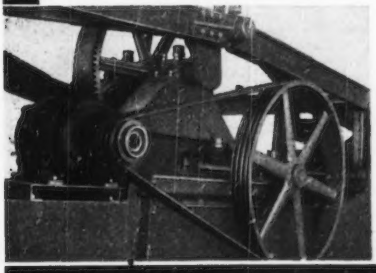

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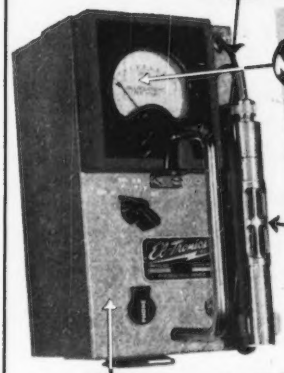

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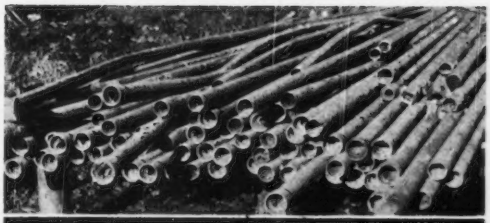

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1¼"	1.660	1.380	200	0.27	300 ft. coils
1½"	1.900	1.610	200	0.32	250 ft. coils
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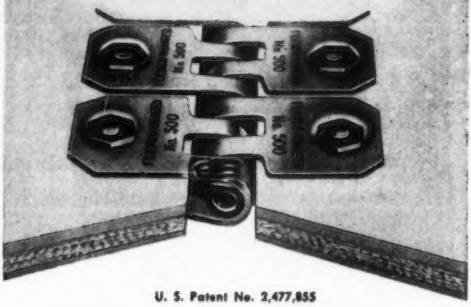

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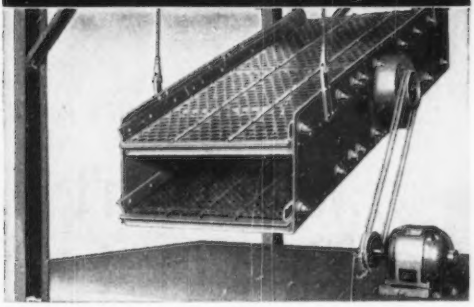
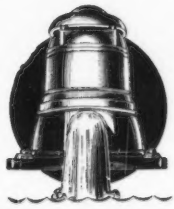


Production men throughout the industry are finding that screening costs are way down with the remarkable Link-Belt screen with concentric vibrating motion. New production records are being set daily through increased amplitude at high speeds; cushion smoothness in starting and stopping; clear screening surface and many other features. Why not investigate today? Write for Book No. 2154.

LINK-BELT COMPANY

Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Johannesburg. Offices in Principal Cities. 11,995

LINK-BELT Vibrating SCREENS



Layne Vertical Turbine Pumps are made of tough and long lasting materials.

WATER LIFTING

You can tremendously reduce the cost of mine de-watering by installing Layne Vertica Turbine Pumps. These Pumps are noted for their extra high efficiency and are being used by some of the world's largest mines. They are extra heavy producers and move tremendous quantities of water at very low expense for power. For catalogs and further information address

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WELL WATER SYSTEMS
VERTICAL TURBINE PUMPS

ENGINEERED ESPECIALLY FOR ROOF BOLTING

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Because they have been engineered especially for your roof bolting operations, our new Elreco expansion bolts and shells are your best buy for speedy installation, sure safety.

Made of high-grade malleable iron, the unit allows expansion from the 1¼-inch insertion diameter to a maximum of $1\frac{11}{16}$ inches. The plug is designed to engage either the sides or top of the hole. The expander shell has a ridged contour for easy insertion and secure holding.

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Serving the mining industry since 1892

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A MACHINE IN HIS PLANT

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He checks every piece of mechanical equipment he owns for wear, lubrication, efficiency.

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WANTED, BY large British mining company in the South of Spain, experienced metallurgical engineer for the post of smelter superintendent. Applicants should be between thirty and forty years of age and have had wide experience of smelting copper ores and concentrates. Commencing salary £1200 Sterling per year, with free unfurnished quarters and certain allowances. Salary and allowances cannot be paid in U. S. Currency. Reply giving age, full details of education and experience and state whether married or single. Married men must give number and ages of children. P 7703, Engineering & Mining Jl.

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ENGINEER WIDE experience mining metallurgical design construction metal and nonmetal. Available for consulting or operation, foreign service acceptable. PW 6999, Engineering & Mining Jl.

SUPERINTENDENT, GENERAL, Mill or Mine, Graduate EM. 56. Versatile, practical, long experience, development, Production, or exploration, Canada, U. S. A., Orient, Latin America, congenial, excellent references, Spanish. Make good Managers assistant in Canada; efficiency man, presently in British Columbia. Go anywhere depending conditions. PW 7555, Engineering & Mining Jl.

ELECTRICIAN. Go anywhere. 30 yrs. experience min-mill elect. installation and maintenance. A-1 on locomotives, power circuits, control, generator-motor winding A.C. or D.C. Best results in charge of elect. dept. Will accept lead electrician or do straight all around elect. work. References furnished. Available on 15 days notice. Married, 49. Housing not required for a while. PW-7800, Engineering & Mining Journal.

EXPERIENCED ACCOUNTANT. Extensive foreign work mining, oil, lumber, manufacturing. Fluent Spanish. Some French. PW 7817, Engineering & Mining Jl.

MINING ENGINEER with experience in writing technical articles and reports will consider part time or temporary position in or near Washington. PW 7816, Engineering & Mining Jl.

MINE MANAGER Or Supt. Age 45, good health, speak Spanish, 22 years experience in U. S. and foreign, graduate, married, children, complete working knowledge of all types of mechanized mining, including Joy equipment, exploration, development, construction and labor relations in metallic and nonmetallic mines. PW6927, Engineering & Mining Jl.

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1—42" x 450' Robins Belt Conveyor with Robins anti-friction troughing and return idlers with dual drive gear reducer and 75 H.P. A.C. motor.
1—42" x 125' Robins Conveyor, same specifications.
Please send for details and low price.
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Fuller-Lehigh Mills—22"—47" & 52"—Bradley Mills.
Jaw Crushers—From 10" x 6" up to 36" x 24".
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1—7" Newhouse Crusher, latest type.
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Ring Roll Mills—Sturtevant No. 1—No. 2.
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Magnetic separators—jigs—screens—classifiers and thickeners.
5', 6' & 7' dia. Rod Mills.
Mine Hoists.
One 4 roll Raymond Mill, low side.
8' x 10'—8' x 12'—11½' x 19' Rotary Filters.
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COMPRESSORS: Sullivan WN4, angle compound, 22 x 13 x 14, with 500 H.P. synchronous motor. Worthington 29 x 21 x 23 with 600 H.P. synchronous motor.
CRUSHERS, GYRATORY: Various makes, sizes 12 x 44" up to 42 x 134".
CRUSHERS, JAW: Various makes, 4 x 5" to 48 x 60".
CRUSHER SPECIALS: 1—Allis Chalmers Superior 20" and 1—7½ K Gyratory. 1—Allis Chalmers 36 x 48" and 1—Farrel 24 x 36" Jaw.
CRUSHERS, REDUCTION: Symons 2 ft., 3 ft. and 4 ft. Telsmith 2 ft., 3 ft. and 4 ft. Gyrasphere.
DRYERS & KILNS: 5 ft. x 40 ft. up to 10 ft. x 90 ft., single and double shell.
MINE HOISTS: Single and double drum, 150 H.P. up to 2,500 H.P.
A. J. O'NEILL, Lansdowne, Pa.
Phila. Phones: Madison 3-8300 - 3-8301.

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150 Ton Plant: 6x6 Allis-C mill; Dorr Classifier; Sub-A flotn; American 2-leaf Filter; bolted steel building.
Mill: Marcy 6x6, 440-v syn. motor.
Thickener: Dorr 40x8 ft.
Conveyor: 30" belt 125 ft. ctrs.
Weightometer: Merrick Model E complete.
Magnetic Pulley: 16x21½" with m.g. set.
Loaders: Elmco 12-B; GDCo. G-9; Sullivan.
Headframe: 60 ft. 3-comp., bolted steel.
Transformers: Three 200 kva 22000-220/440; three 150 kva 2260-220/440.
PAUL F. SMITH
153 N. Virginia St. Reno, Nevada

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1—Box Iron Wks. Sgl. Drum with 15 HP Motor.
1—"22 Vulcan with UD-6 Gas Engine.
1—25 HP H & B Converted Geared Hoist with Motor.
1—7½ HP Crow Converted, with Motor.
1—50 HP 3 drum Elec. Slusher.

FLOTATION MACHINES

2—24 Denver "Sub-A", 8-cell, wood tanks.

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4—6' x 16' Deister Type, with new rubber deck covering, riffles & motors.
2—6' x 16' Butchart, with new rubber deck covering, riffles & motors.

FILTERS—DISC

1—4', 6-disc Elmco, with vacuum equipment.

CARS—ORE

3—R.B. 18 cu. ft.
6—16 cu. ft. with stuffing box wheels.

CLASSIFIERS

1—60" x 23' Denver Equip. Simplex Cross-Flow Classifier, with Gear Motor.
1—6' x 22' Dorr Type Duplex Rake Classifier.

PUMPS

6—2" Wilfley Sand Pumps.
2—3 x 4½ Goulds Pyramid.
2—6" Hydroseal Pumps.
1—8" Hydroseal Pump.
Ingersoll Rand Motor Mtd. Pumps.
Peerless Deep Well Pumps.

DRILL PRESSES

1—26" Hamilton Heavy Duty.
1—Kennedy-Otto, with 1 HP Vertical Gearhead Motor.

MISCELLANEOUS

4—Tons 12 Rail.
25—Tons 85 Rail.
1—42" x 20' Center Conveyor.
1—30" x 70' Center Conveyor.
2—18' x 18' Fine Ore Wood Bins.
1—Elec. Pipe Thawer Conditioner.
1—16' x 10' Dorr Thickener.
1—5 KW G.E. Transformer, 440-110/220.
1—I.R. Wagon Drill.
1—Sullivan Wagon Drill.
1—16 x 12 Gardner Horiz. Compressor, 272 CFD.
Crushers — Revolving Screens.
1—Barrett Bond Tester.

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1000 KW to 100 KW
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1—Kent Maxecon, Type #7, Ring Roll Mill & Drive.
1—Sturtevant, No. 2, Ring Roll Mill & Drive.
1—24" x 20" Type B Jeffrey Hammermill.

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P. O. Box 102 **Lansdowne, Pa.**

AIR COMPRESSORS
9 Electric 5000, 3865, 3178, 2200, 1578 & 1302 Ft.
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LOCOMOTIVES AND CRANES
12 Diesel 80, 65, 45, 30, 20 & 10 Ton Locomotives.
22 Gas, 35, 25, 16, 12, 8 & 6 Ton Locomotives.
25 Ton Amer. Gas. Loco. Crane.
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7—60x84", 40x48, 36x42, 24x36 & 28x36.
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Indirect: 70"x35', 72"x55', 80"x50', & 84"x50'.
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Single Shell: 3'x20', 5'x30', 5'x50', 6'x30', 6'x60', 80"x60', 7'x50', 90"x60', & 8'x50'.
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5'x22", 6'x48", 7'x48", & 8'x22" Hardinge Conical Ball Mills.
4x4, 6x6 & 8x5 Cylindrical Ball Mills.
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10, 14 & 16 ft. Air Separators.
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40—10 000 Gal. R. R. Car Tanks.
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20 & 21 Raymond Automatic Pulverizers.
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Heavy-duty, smooth bore, wire inserted Suction Hose. Flexible and strong. For use in mines, sewers, trenches, etc., with diaphragm pumps, pressure pumps and other contractors equipment. Prices shown include I.P.T. Couplings attached to each length.

I. D. Size and Length	Price Per Length	I. D. Size and Length	Price Per Length
1¼"x10 ft.	$ 5.00V	3"x15 ft.	$38.50
1¼"x15 ft.	7.50V	3"x20 ft.	47.50
1¼"x20 ft.	10.00V	4"x10 ft.	25.00V
1½"x10 ft.	6.50V	4"x20 ft.	68.00
1½"x15 ft.	9.00V	5"x15 ft.	53.00V
1½"x20 ft.	14.00V	5"x30 ft.	90.00V
2"x10 ft.	12.00V	6"x10 ft.	90.00
2"x15 ft.	22.75	6"x15 ft.	126.00
2"x20 ft.	30.25	6"x20 ft.	161.00
2½"x10 ft.	15.00V	*I.P.T. Nipples or Couplings attached to hose.	

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Cotton jacket, rubber lined hose suitable for water supply and discharge service. Constructed exactly like Fire Department hose. Light in weight. For pressures to 200 lbs. Attached to each length are Iron Pipe Thread Couplings.

Inside Diameter	Price Per 25 Ft. Length	Price per 35 Ft. Length	Price per 50 Ft. Length
1½"	$8.75V	$15.75	$21.75
2"	15.00	20.30	28.25
2½"	17.50V	23.00V	35.00
3"	25.75	34.25	47.50
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2½" x 8 PLY DUCK AND CORD CONSTRUCTION SUITABLE FOR 400 LBS. WORKING PRESSURE.

For that difficult job where high pressures are encountered Carlyle offers this rugged flexible hose saving you over 50% in cost and giving dependable service for the following jobs—

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- Hydraulic Grout
- Steam to 100 lbs. Pressure
- Oil Discharge

Low Prices at ..... $1.00 ft. V
Available in 10-15-25-50-50 ft. Lengths.
High Pressure Couplings attached as follows:

	Per Set
Male and Male .....2½"I.P.T.	$10.00
Female & Male .....2½"I.P.T.	12.00
Female & Female .....2½"I.P.T.	16.00

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250 Lbs. Working Pressure. Heavy-duty extremely flexible. Pneumatic Air Hose. For all Air Tools, Compressors, Chippers, Riveters, Drills and Breakers. Each length complete with Universal Air Hose Couplings attached. These Couplings are quick snap and interchangeable with Air King, Chicago, Cleveland and others.

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½"x25 ft.	$ 7.75
½"x50 ft.	14.00
¾"x25 ft.	9.25
¾"x50 ft.	17.00
1"x25 ft.	11.00
1"x50 ft.	20.50

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2—1½ ton Mancha "Little Trammer" battery, 18"-21" gauge.
2—2½ ton Mancha battery, 18"-24" gauge.
1—2½ ton Whitcomb battery, 24" gauge.
2—5 ton Westinghouse battery, 24"-36" ga.
2—7 ton General Electric battery, permissible type, 36" gauge.
2—8 ton General Electric battery, 36" ga.
4—10 ton Vlas battery, 36" ga.
3—6½ ton General Electric trolleys, 36" ga.
2—18 ton Davenport steam locomotives, 1—18" and 1 standard gauge.
1—3 ton Whitcomb gas eng. driven, 24" ga.
1—3 ton Ruth gas engine driven, 18" ga.
1—5"x16" Porter compressed air, 18" ga.
1—5½"x16" Baldwin compressed air, 30" ga.

BALL AND ROD MILLS

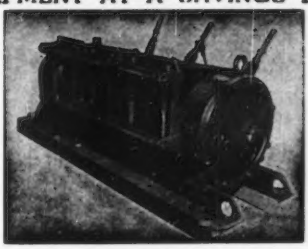
1—30" x 24" New Morse Bros. Batch Mill.
1—4' x 4' Standard Ball Mill.
2—6' x 36" Hardinge Conical Ball Mills.
1—6' x 8' Marcy Ball Mill.
1—8' x 22" Hardinge Conical Pebble Mill.
1—3' x 8' Denver Eng. Works Tube Mill.
1—5' x 36" Hardinge Conical Ball Mill.
1—64½ Marcy Ball Mill.

MISCELLANEOUS EQUIPMENT

6000'—1¼" new Jones & Laughlin improved plow steel wire rope, 6x19, lang lay, hemp center.
800'—24"x7 ply rubber covered conveyor belting.
1—Chicago-Pneumatic model P10EA1P diamond drill with column mounting.
1—8½" telescope Gurley transit.
1—11" telescope Gurley transit.
47—30"x60" air receivers, 125#, 24 cu. ft.

REDWOOD TANKS

We carry a large stock of air dried redwood lumber and can make up any size tank to order.



TUGGER HOISTS

1—I.R. Utility Air Hoist, single drum, Model E3.
1—I.R. "Little Tugger", single drum, Model 6 HC.
1—I.R. Size 4-INN-0J2 Drum Air Hoist.
1—Sullivan RH 5 11P Single Drum Electric Slusher Hoist.
1—Sullivan RH 7½ HP Single Drum Electric Slusher Hoist.
2—I.R. Size 107, 7½ HP Single Drum Electric Slusher Hoist.
1—I.R. Size 5NN-011 5 HP double drum electric slusher hoist.
1—I.R. Size 29-MNM-2D 20 HP Three Drum Electric Slusher Hoist.
1—Sullivan Model B-211 25 HP Double Drum Electric Slusher Hoist.
3—Sullivan Type HE 6½ HP D.C. Single Drum Electric Hoists.
9—Sullivan Type HDE8½ HP D.C. Double Drum Electric Hoists.

FILTERS

1—3' x 2' Morse All Metal Drum Filter.
1—3' x 4' Oliver Drum Filter.
1—4' x 1 disc Oliver Filter.
1—4' x 3 disc Morse Filter.
2—6' x 2 Disc American Filters.

JAW CRUSHERS

3—4" x 6" New Morse Jaw Crushers.
2—8" x 8" Universal Semi-Steel Crushers.
1—8" x 24" Rogers Cast Steel Crusher.
1—9" x 15" Farrell Blake Type.
1—9" x 16" New Morse Crusher.
1—8" x 36" Universal All-Steel Crusher.
1—9" x 36" Cedar Rapids.
1—15" x 20" Universal All-Steel Crusher.
1—10" x 24" Allis-Chalmers Jaw Crusher.
1—15" x 28" Pacific All Steel Crusher.

DIESEL-GENERATOR SETS

3—15 KW Century Generators driven by Waukesha-Hesselman diesels.
1—30 KW Century Generator driven by Buda diesel.
1—50 KW Western Electric Generator driven by Cummins diesel.

CLASSIFIERS

1—48" x 2'6" Akins Spiral Classifier, high weir type.
3—8ft. Joe Type Hydraulic Classifiers, 10 cells, 20 spigots.

BOILERS

1—50 H.P. Acme Locomotive Type.
2—80 H.P. Llewellyn Locomotive Type.
3—90 H.P. Kewanee Locomotive Type, 200# pressure.
1—125 H.P. Locomotive Type.
3—100 H.P. Horizontal returning tubular.
1—150 Kewanee Horizontal return tubular.
2—250 H.P. Stirling B&W Water Tube.
1—100 H.P. Oil City Water Tube

We have in stock new Mercator Vertical Tubular Boilers from 3 to 20 HP. for coal, gas, or oil firing.

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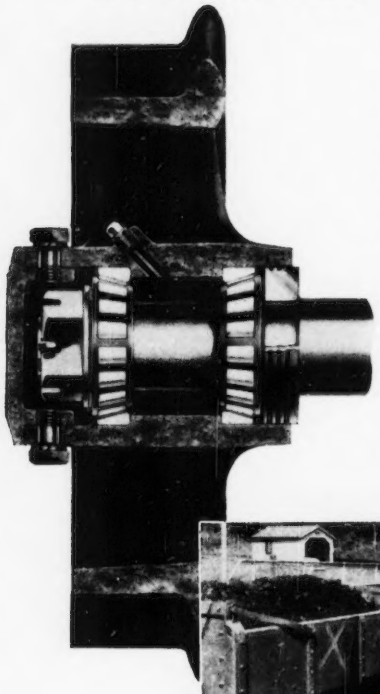
Why more than half a million mine cars have rolled on TIMKEN® bearings



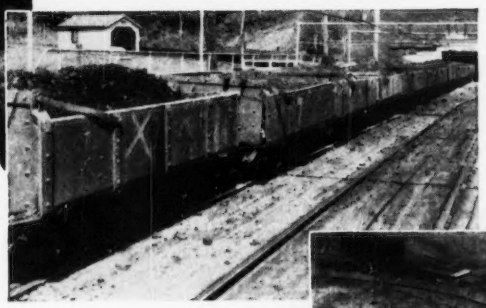
THROUGHOUT the United States, over 500,000 mine cars have been equipped with Timken® tapered roller bearings to insure long bearing life and trouble-free performance. Many of these cars are more than twenty years old and the original bearings still have years of service ahead of them.

Due to the line contact between rollers and races, Timken bearings have tremendous load-carrying capacity—have the rugged strength required for rugged service. Tapered design permits Timken bearings to take both radial and thrust loads in any combination — eliminates the need for extra thrust bearings or thrust plates. Timken bearings reduce friction to a minimum; easier starts and higher speeds are possible. Train lengths can be greatly increased.

Long bearing life is assured with periodic lubrication. All makes of bearings, including Timken, must be regularly lubricated for maximum bearing life.

No other bearing gives you all the advantages you get with Timken bearings. Be sure the mine cars you buy are equipped with Timken bearings—and look for the trade-mark "Timken" on every bearing you use. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.



STILL GOING STRONG after more than 20 years, these cars, part of the 660 Timken bearing equipped cars at Consolidation Coal Company (W. Va.) Mine 63, Monongah, West Virginia are still moving maximum tonnage at minimum expense on Timken bearings.

MORE THAN TWENTY YEARS ago, these Timken bearing equipped cars went into service at the Castle Shannon Coal Company in Cloverdale, Pennsylvania. Part of a group of 526, they have been rebuilt several times—but the original Timken bearings are still on the go.

POSITIVE ROLLER ALIGNMENT

Wide area contact between roller ends and rib of the cone prevent Timken rollers from skewing. Result: bearings roll easier, last longer.

The Timken Company is the acknowledged leader in: 1. advanced design; 2. precision manufacture; 3. rigid quality control; 4. special analysis steels.

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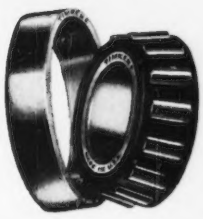

NOT JUST A BALL ○ NOT JUST A ROLLER ⬭ THE TIMKEN TAPERED ROLLER ⬭ BEARING TAKES RADIAL ⫞ AND THRUST ⫟ LOADS OR ANY COMBINATION